CAROLINA POWER & LIGHT
MAYO ELECTRIC GENERATING PLANT

MAYO CREEK DAM
ASH POND DAM
PERSON COUNTY, NORTH CAROLINA

LAW PROJECT NO. 30720-9-3524

HISTORICAL VOLUME

FIVE-YEAR INDEPENDENT CONSULTANT INSPECTION
AS REQUIRED BY
NORTH CAROLINA UTILITIES COMMISSION

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TABLE OF CONTENTS

1.0 PROJECT INFORMATION

This section contains a summary of information about the dams and appurtenant structures at the Mayo Electric Generating Plant. The information is taken from Independent Consultant Inspection Reports dated 1989[(1)*] and 1994[(2)].

1.1 SITE LOCATION

The Mayo Electric Generating Plant is located in Person County, approximately 10 miles northeast of Roxboro, North Carolina. The Mayo Creek Dam is located 1,500 feet south of the North Carolina-Virginia State line. The center of the dam is at approximate coordinates N 1,014,256, E 2,036,492 on the North Carolina Grid System. The Ash Pond Dam is located approximately 1,000 feet south of the North Carolina-Virginia State line. The center of the dam is at approximate coordinates N 1,014,700, E 2,031,217 on the North Carolina Grid System. Exhibit 1 is a site plan showing the location of both dams, including the watershed boundary and capacity curves for the Mayo Creek Dam. The Ash Pond Dam is located about 1 mile west of the Mayo Creek Dam.

1.2 GENERAL DESCRIPTION

1.2.1 Mayo Creek Dam

The Mayo Creek Dam is a random rock fill embankment with a compacted core of clayey soil, a downstream filter system, and a rock toe. The rock fill shell is constructed of material that was excavated from nearby areas.

As shown on Exhibit 2, the main portion of the Mayo Creek Dam is 2,600 feet long and 600 feet wide at the base. There is an 800-foot long lower height section east of the east abutment. Exhibit 3 shows typical design sections. The dam is approximately 100 feet high, with a 15-foot wide crest at elevation 450 feet (all elevations are referenced to mean sea level datum). The grassed downstream slope is 2.5(H):1(V) and the rip-rap protected upstream slope is 2.75(H):1(V). A clay core in the main section has a top elevation of 445 feet and is extended by a cutoff trench to firm rock. As shown on Exhibit 3, a downstream filter system, draining the core, extends from elevation 440 feet into a horizontal drainage blanket. The drainage blanket is underlain with riprap bedding which terminates at the downstream rock toe.

Outlet works for the dam include a 72-inch diameter prestressed concrete pipe at the bottom of the dam connected to a vertical concrete intake structure and a 10-inch diameter low level release system, as shown on Exhibit 4.

The dam was constructed on Mayo Creek which has a drainage area, at the dam site, of about 53.5 square miles and an average flow of 35 to 53 cubic feet per second[(3)]. The storage capacity and surface area are 88,000 acre-feet and 2,800 acres, respectively, at a normal water elevation of 434 feet.

Both the main and emergency spillways are located east of the dam. Exhibit 5 shows a plan of the spillways. The main spillway, constructed of reinforced concrete, has an uncontrolled crest at

* The number in parentheses indicates the reference listed in the Reference List, Section 3.0.

elevation 434.0 feet. The emergency spillway was cut through original ground to a control section elevation of 437.5 feet. The floor of the emergency spillway (as designed) consists of grassed soil, exposed weathered rock, and shot rock placed in over-excavated areas.

1.2.2 Ash Pond Dam

The Ash Pond Dam was designed by Carolina Power & Light Company (CP&L) and Mr. William Wells, P.E. Exhibit 6 is a site plan showing the location of the dam. The Ash Pond Dam is an earth dam approximately 90 feet high, 2300 feet long, and 400 feet wide at the base. Exhibit 7 shows a plan and profile of the dam. The crest of the dam is at elevation 490 feet and the normal pond level is elevation 480 feet.

As shown in Exhibit 8, the dam is a random fill embankment with impervious materials placed at the upstream face, a random fill toe, and a sand filter toe drain. A cutoff trench is under the upstream toe. At each end of the dam, an impervious blanket is tied in to the cutoff trench and extended up the original ground slopes and into the ash pond for approximately 300 feet from the dam center line. Side slopes are 2.5(H):1(V). Slope protection on the upstream slope consists of 18 inches of rip-rap on an 8-inch thick bed of crushed stone. The rip-rap extends for the full height of the slope above elevation 425 feet. The downstream slope has rip-rap over the lower portions and two seepage collection and monitoring weirs, as shown on Exhibit 9.

The Ash Pond storage capacity and surface area are 4,100 acre-feet and 140 acres, respectively, at a normal pond elevation of 480. There is no discharge piping through the dam. The Ash Pond discharge is directed back to the main reservoir by a channel constructed at the northeast corner of the Ash Pond. An earthern dike, with a surface skimmer for containment of ash cenospheres, is located at the entrance to the discharge channel. This dike does not affect the safety of the Ash Pond Dam.

1.3 SIZE CLASSIFICATION

Guidelines published by the U.S. Army Corps of Engineers (COE)[4] establish size classifications on the basis of the dam height and storage capacity (measured to the top of the dam). Power company dams are exempt from the North Carolina Dam Safety Law as they are regulated by the North Carolina Utilities Commission. For reference purposes, however, the size classifications defined in the North Carolina Dam Safety regulations in the North Carolina Administrative Code Title 15, Subchapter 2K, Section .025 (15NCAC2K.0205) are also given. Size classifications consider both storage volume and dam height, with the larger of the two governing classification. The size classifications for the two dams are as follows:

STRUCTURE	APPROXIMATE STORAGE* (acre-feet)	HEIGHT (feet)	CORPS OF ENGINEERS SIZE CLASSIFICATION	NORTH CAROLINA ADMINISTRATIVE CODE CLASSIFICATION
Mayo Creek Dam	142,828	100	Large	Very Large
Ash Pond Dam	6,000	90	Intermediate	Large

*At top of dam.

1.4 HAZARD CLASSIFICATION

The area downstream of both dams is undeveloped agricultural land or woods extending at least to the state line. An unpaved secondary road (SR 1501) crosses below both dams. Failure of either dam would cause severe damage to the road and send a flood wave along Mayo Creek.

Considering the extent of damage that would result from failure, a hazard classification of significant has been used for both dams in all previous independent inspections. A 1999 site reconnaissance of the downstream areas did not reveal any development changes that would warrant a change to these classifications.

1.5 HISTORICAL SUMMARY

1.5.1 Mayo Creek Dam

The general site area for the dam was first explored in 1973 by Law Engineering Testing Company (LETCO), of Raleigh, North Carolina(5). In 1974, Gibbs & Hill, Inc. of New York City was retained by CP&L to design the power plant and dam. A final geotechnical exploration was conducted by LETCO and reported in 1974(6).

Construction of the dam was by English Construction Co., of Altavista, Virginia with Mason C. Day Company of Danville, Virginia, as the grading subcontractor. CP&L supervised the construction. Testing services were provided by Soil and Materials Engineers (S&ME) of Raleigh, North Carolina. Gibbs & Hill personnel also participated in construction review. Construction began in February 1978 and the dam was completed and water impoundment begun in August, 1980. The lake first reached normal pool on April 16, 1983.

The first dam safety inspection under the NCUC program was conducted in 1984 by Dr. Ralph Fadum(7). The second dam safety inspection was performed in 1989 by Barney C. Hale, P.E. and J. Allan Tice, P.E. of Law Engineering and Environmental Services, Inc. (Law)(1). The third dam safety inspection was performed in 1994 by Mohsen Sefat, E.I.T. and Clay E. Sams, P.E. also of Law(2). None of these inspections found significant safety concerns, but each inspection report provided recommendations for maintenance and/or minor repairs. The maintenance issues were primarily related to erosion control on the downstream slope, control of vegetation on the slopes and in the rip-rap, and clearing vegetation from the primary and emergency spillway discharge channels. Repairs included caulking of vertical joints in the primary spillway and patching concrete in the primary spillway invert. Maintenance and repair activities are described in more detail in Sections 2.1.7 and 2.2.7.

1.5.2 Ash Pond Dam

The Ash Pond Dam was designed by CP&L and Mr. William L. Wells, P.E., a private consultant. The geotechnical exploration was conducted by LETCO. Construction was by Mason C. Day Co., of Danville, Virginia. CP&L personnel provided full time inspection. Testing services were by S&ME. Construction began in August 1981 and was completed in October 1982.

None of the first three dam safety inspections revealed significant safety concerns. As at the Mayo Creek Dam, some maintenance activity was recommended. Erosion control, vegetation control, and cleaning of the discharge weir pipes were the primary maintenance issues.

1.6 GEOLOGY AND SEISMICITY

1.6.1 Geology

The site is in the Piedmont Geologic Providence, at the Carolina Slate Belt-Charlotte Belt boundary. The rocks in the area are primarily metamorphic, derived from sediments and igneous rocks of Pre-Cambrian and Paleozoic age. The rock-forming events, including recrystallization, folding, and faulting are all ancient, the latest known deformation in the region having occurred in the Triassic period about 180 million years ago[8].

A geologic exploration was conducted in 1973-1974 by LETCO under the supervision of CP&L[6]. The rocks encountered were grouped into the following four general categories: greenstone, granitic gneiss, quartzo-feldspathic phyllite, and metatuff. The characteristics of each of these four rock types are described in detail on Exhibit 10.

1.6.2 Seismicity

The site lies in the Appalachian Piedmont seismotectonic region in a relatively inactive area. During historic times the Southeastern United States (with the exception of the immediate vicinities of Charleston, South Carolina, New Madrid, Missouri, and Giles County, Virginia) has experienced only occasional scattered earthquakes of moderate intensity. The site lies in Zone 2 with a seismic coefficient of 0.10g for determining the sliding and overturning stability of concrete structures[9]. Under the 1976 COE Guidelines[4], which are the basis for the NCUC inspections, seismic stability assessments are not required in seismic zones 0, 1 and 2 provided static stability analyses are satisfactory and conventional safety margins exist. With respect to liquefaction, the COE guidelines indicate that a liquefaction assessment is required at seismic zone 2 sites where the "embankment or foundation soils are suspect of being susceptible to liquefaction or excessive deformation".

LETCO's report on the subsurface investigation at the Mayo site recommended a design acceleration of 0.1g for the design of structures founded on bedrock[5].

2.0 DESIGN AND CONSTRUCTION INFORMATION

2.1 MAYO CREEK DAM

2.1.1 Subsurface Information

The subsurface exploration program was planned by CP&L and Gibbs & Hill and conducted by LETCO in 1974. The locations of the borings made are shown in Exhibit 11. Three geologic profiles are shown in Exhibits 12 and 13. The subsurface conditions at the various sections of the site were summarized in the 1974 LETCO report[6] as follows:

2.1.1.1 West (Left) Abutment

"The west abutment is underlain by very stiff to hard residual sandy silts usually 5 to 20 feet thick overlying granitic gneiss (including some thin chlorite schist layers). Based on previous experience, the average soil permeability is estimated to be 10^{-6} centimeters per second. The upper 30 to 50 feet of rock below the hard soil zone is slightly weathered and consists of moderately hard granitic gneiss (very competent from a bearing capacity standpoint). Below this weathered zone, the granitic gneiss becomes hard to very hard.

Rock Quality Designation (RQD) values in the foundation rocks are relatively low due to joint and foliation planes in the granitic gneiss. RQD in this abutment is commonly less than 20 percent in the upper 30 feet of rock. However, the fractures are relatively tight; water pressure tests indicate overall rock permeabilities of 20 to 50 feet per year, (2 to 4 x 10^{-5} centimeters per second)."

2.1.1.2 Floodplain

"The floodplain of Mayo Creek is about 1,200 feet wide. Soils in the floodplain are primarily alluvial clayey sandy silts 8 to 12 feet thick, with a 6-inch to 1-foot thick gravel layer at the base of the alluvium. The alluvial silts are characteristically soft, having low shear strength and high compressibility. The horizontal permeability of the alluvium is relatively high in sandy or gravelly zones (probably in the range of 10 to 10^{-2} centimeters per second). For these reasons, the alluvium is unsatisfactory as dam foundation material for a high embankment, and it was removed from the foundation area.

In most areas, the alluvium rests directly on moderately hard to hard rocks of the Hyco formation, consisting of silty phyllites with some thin "greenstone" or chlorite phyllite layers. These foundation rocks are closely jointed, with closely spaced cleavage planes dipping 40 to 60 degrees southeast. RQD values in the rock underlining the floodplain are seldom over 20 percent; however, the rock fractures are relatively tight, with overall rock permeabilities in the range of 20 to 50 feet per year as indicated by water pressure tests in boreholes."

2.1.1.3 Inactive Fault Zone

"Ancient faulting of the rock near the west (left) edge of the floodplain has produced anomalous, deep weathering. In the middle and eastern parts of the floodplain, the underlying rocks, though hard, show evidence of nearby faulting (micro-faults in cores, thin weathered fracture zones, mineralization) indicating other locations of deeply weathered foundation rocks exist.

The inactive fault zone is oriented in the north-northwest and south-southeast direction. The width of the inactive fault zone varies from one point to another with the maximum width not exceeding six feet. The materials inside the inactive fault zone are composed of quartz, granite, phyllite and a narrow band of greenstone. Most of these rocks appear to be relatively tight and unweathered with the exception of the greenstone which was weathered and decomposed to a saprolite texture.

From the engineering point of view, the materials inside the inactive fault zone have bearing capacity and shear strength compatible with the rocks in other foundation areas. Because of the tightness of the foundation rocks in the inactive fault zone, migration of soil particles from the upstream shell into foundation rocks or through foundation rocks toward downstream is unlikely."

Consideration of the inactive fault zone was included in the original design criteria for the dam(10). Curtain grouting of the foundation was included in the construction as shown in Exhibit 14. The grouting program is described in more detail in section 2.1.7.

2.1.1.4 East (Right) Abutment

"At the east abutment there is a thin (2 to 5 feet) veneer of stiff to hard residual sandy silt underlain by 5 to 20 feet of hard to very hard saprolite of the underlying Hyco formation. The average soil permeability is 10^{-6} centimeters per second. The Hyco rocks under the east abutment are similar to those under the floodplain except that the abutment rocks are slightly less fractured, with RQD values commonly between 10 and 45 percent. Pressure tests indicate rock permeability on the order of 20 to 50 feet per year."

2.1.1.5 Borrow Material Studies

Several potential borrow areas were studied by LETCO and numerous laboratory tests were conducted(11). A primary borrow area was selected on the east side of the reservoir in the general vicinity of the emergency spillway. Strength parameters for the dam design were based on the materials from this borrow area.

During the early stages of construction, wet conditions in the designated primary borrow area led to the study of two additional areas by CP&L and Gibbs & Hill. Test pits and borings in two areas were made in the areas by S&ME. Exhibit 15 shows the locations of borrow areas, the test pits, and additional test pits excavated under Gibbs & Hill's direction in October 1978. Laboratory tests of the soil material proposed for use as impervious core (primarily from borrow area 2) were assigned by Gibbs & Hill and conducted by S&ME and LETCO. Exhibit 16 contains a summary of the laboratory test data. The use of soils from borrow area 2 as impervious core was approved by Gibbs & Hill in a report dated October 25, 1978[12].

The materials used for the core were silty clays and clayey silts. Laboratory tests indicated plasticity indices performed on these soils ranged from 4.5 to 23.5 percent. Additional silty clay, suitable for core material, was obtained from borrow area No. 1. Exhibit 2 lists 421,858 cubic yards as the compacted in-place volume of the impervious core materials.

The random fill was obtained from borrow area No. 1, located at the ridge running parallel to original State Road 1501 on the eastern side of the reservoir, (Exhibit 15). The area extends from the Mayo Creek flood plain toward the emergency spillway.

Materials used for the random fill were silty clays and weathered rock obtained at depths ranging from one to twelve feet. The maximum dry density of these materials ranged from 107 pounds per cubic foot to 135 pounds per cubic foot. Exhibit 2 lists 1,329,259 cubic yards as the compacted in-place volume of random fill material for the main dam and the saddle dam.

The filter material was manufactured on site by crushing the granitic gneiss. Tests of core filter material compatibility were performed by GAI Consultants, Inc., under contract to Gibbs & Hill to determine whether the material was adequate for construction of the chimney drain downstream of the core. The test report[13] found no significant migration of core material and no development of piping was observed during the testing.

2.1.2 Design Information

The main section of the Mayo Creek Dam is a random rock fill embankment with a compacted core of clayey soil, a downstream filter system, and a rock toe. The rock fill shell is constructed of local material.

Exhibits 2 and 3 show plan and profile views and typical cross sections of the Mayo Creek Dam. The main portion of the dam is 2,600 feet long and 600 feet wide at the base. The dam is approximately 100 feet high, with a 15-foot wide crest at elevation 450 feet (all elevations are referenced to mean sea level datum). The grassed downstream slope is 2.5(H):1(V) and the rip-rap protected upstream slope is 2.75(H):1(V). The clay core has a top elevation of 445 feet and is extended by a cutoff trench to firm rock. A downstream filter system, draining the core, extends from elevation 440 feet into a horizontal drainage blanket. The drainage blanket is underlain with riprap bedding which terminates at the downstream rock toe. Outlet works for the dam include a 72-inch diameter prestressed concrete pipe bottom and a 10-inch diameter low level release system, as shown on Exhibit 4. There is a lower height section 800 feet long east of the east abutment which was constructed only of random rock fill. This section is referred to on some drawings as the "saddle dam".

The dam was constructed on Mayo Creek which has a drainage area, at the dam site, of about 53.5 square miles and an average flow of 35 to 53 cubic feet per second[3]. The storage capacity and surface area are 88,000 acre-feet and 2,800 acres, respectively, at a normal water elevation of 434 feet.

Both the main and emergency spillways are located east of the dam. Exhibit 5 shows a plan of the spillways. The main spillway, constructed of reinforced concrete, has an uncontrolled crest at elevation 434.0 feet. The emergency spillway was cut through original ground and has a crest at elevation 437.5 feet. The floor of the emergency spillway (as designed) consists of grassed soil, exposed weathered rock, and shot rock placed in over-excavated areas. Appendix A contains a table that summarizes engineering data for the Mayo Creek Dam.

2.1.3 Stability Analysis

2.1.3.1 Reservoir Slopes

Natural slopes adjacent to Mayo Creek and its tributaries average about 10° to 12°, with short pitches (usually less than 50 feet) approaching 30°. No evidence of pre-existing major landslides was seen during the pre-design geologic reconnaissance or on aerial photographs of the site. The original site exploration[5] concluded that favorable aspects of the site with respect to slope stability were: a) the relatively shallow rock depths around the reservoir, b) the steep dip (usually around 60°) of the rock cleavage planes, and c) the absence of high steep slopes above the reservoir. The geotechnical report concluded that no slope instability should be expected for the natural slopes[6].

2.1.3.2 Embankment Stability

Results of laboratory tests on initially proposed borrow material are shown in Exhibit 16. Stability analyses were conducted by Gibbs & Hill using a wedge analysis and using circular arcs and the modified Bishop method. The computer program "Slope", developed at M.I.T., was used for the circular arc analyses. The circular arc analyses obtained lower factors of safety than the wedge analyses. The shear strengths used in the initial stability analyses are shown on Exhibit 17 and are as follows:

CASE	IMPERVIOUS MATERIAL		RANDOM FILL		FILTER	
	ϕ	c	ϕ	c	ϕ	c
Steady Seepage	24°	0	34°	0	35°	0
Rapid Drawdown	24°	0	34°	0	35°	0
End of Construction	18°	1,000 psf	34°	0	35°	0

Results of the wedge and circular arc analyses are shown on Exhibits 17, 18, and 19, and the results relevant to dam safety are summarized below:

<u>UPSTREAM SLOPE</u>

<u>Condition</u>	<u>Factor of Safety</u>
Rapid Drawdown Condition	1.04 (Shallow Failure Surface, Exhibit 18)

DOWNSTREAM SLOPE

Condition	Factor of Safety
Steady State Seepage	1.50 (Exhibit 19)
Steady State Seepage & Earthquake	1.04 (Exhibit 19)

Each of the computed failure surfaces indicated a shallow, slumping-type failure.

The borrow source actually used for most of the core material was not the one from which the laboratory strength tests used in the stability analysis came. As described in their October 25, 1978 report[12], Gibbs & Hill evaluated the effect of the new borrow materials on stability analyses and used the following shear strengths:

CASE	IMPERVIOUS MATERIAL		RANDOM FILL		FILTER	
	ϕ	c	ϕ	c	ϕ	c
Steady Seepage	20	0	Note (1)	Note (1)	35°	0
Rapid Drawdown	20	0	Note (1)	Note (1)	35°	0

Note (1): New strength parameters and density of the shell (random fill) materials were assumed by Gibbs & Hill based on results of one or more triaxial shear tests on large (15 inch diameter) samples received from CP&L on September 28, 1978; however the new strength parameters for the random fill are not available[12].

For steady state seepage, rapid drawdown conditions, and earthquake conditions in the steady state, factors of safety either exceeded initial factors of safety or COE guidelines factors of safety. Analyses for end-of-construction conditions had lower factors of safety than original calculations, but were considered acceptable by Gibbs & Hill. The circular arc factors of safety[12] that are relevant to dam safety are summarized below:

UPSTREAM SLOPE

Condition	Factor of Safety	Criterion
Rapid Drawdown	1.221	1.0
Partial Pool	1.661	1.5

DOWNSTREAM SLOPE

Condition	Factor of Safety	Criterion
Steady Seepage	1.686	1.50
Steady Seepage with Earthquake	1.298	1.0

Gibbs & Hill also performed wedge analyses, but the circular arc surfaces were found to govern.

2.1.4 Seepage

Based on in-situ permeability testing performed, a maximum coefficient of permeability for the foundation of 50 feet per year[7] was selected as the design criterion in conjunction with a grouting program. LETCO[6] estimated seepage losses through the foundation on the order of 1.0 cubic foot per minute or less. This estimate was based on an assumed overall permeability of 3.0×10^{-3} feet per day, an average gradient of 0.1 applied to the foundation area of the dam, and a 1,500-foot perimeter on each abutment.

2.1.5 Hydrology

Drawdown capability for the reservoir is provided by a 72-inch diameter prestressed concrete conduit connected to a vertical concrete intake structure. Exhibit 4 is a plan view and section of the outlet works for the dam. Four 24-inch-square, rising stem type, sluice gates placed at different levels regulate the intake for the drawdown conduit.

A minimum release of 2 cubic feet per second (cfs) from the reservoir during low-flow periods was recommended in the Environmental Impact Report prepared by the COE[14], and adopted by CP&L. The low level release system is located adjacent to the drawdown pipe as shown on Exhibit 4. The system includes a 10-inch diameter discharge pipe located with an invert at the intake structure of elevation 391 feet. The pipe discharges into the stilling basin downstream from the dam. The outlet is regulated by a 10-inch diameter gate valve, an 8-inch diameter ball valve, and an 8-inch diameter Howell-Bunger valve.

Gibbs & Hill[15] adopted the following criteria for spillway design storms:

"The normal spillway is to discharge all flows resulting from any storm up to and including the 100 year return frequency occurrence.

The emergency spillway, together with the normal spillway, must discharge all flows resulting from storms exceeding the 100 year flood up to and including the probable maximum flood (PMF) without exceeding the dam crest elevation less a certain minimum freeboard to allow for wave action.

A recurrent storm, called by the U.S. Bureau of Reclamation less than maximum probable and starting 48 hours past the peak PMF inflow, must be passed by both spillways without exceeding the maximum water level.

In addition to the above, the peak discharge from the spillways resulting from any storm is not to exceed the peak discharge that would have occurred under natural conditions for the same amount of precipitation, that is, prior to construction of the reservoir."

Hale and Tice[1] noted that, to determine the inflows for spillway design, Gibbs & Hill used information from the National Weather Service[16] and the U.S. Bureau of Reclamation[17]. The 24-hour rainfall amounts chosen were[15]:

STORM	24-HOUR RAINFALL
100 year storm	7.6 inches
Probable Maximum Precipitation (PMP)	30.1 inches
Recurrent Storm	14 inches

The design storms were routed using Soil Conservation Service runoff methods for volumes and Corps of Engineers' methods for peak inflow rate[15]. The analyses found the following:

STORM	RUNOFF VOLUME (acre-feet)	PEAK INFLOW (cfs)
100 year	10,786	18,700
PMP	71,735	114,000
Recurrent	32,350	57,000

An initial hydrologic analysis was conducted by Lockwood Greene Engineers in 1974[18]. Available file documentation does not indicate what parts, if any, of the 1974 study were relied upon by Gibbs & Hill in their final spillway design studies.

Both the 1974 Lockwood Greene study and the final studies summarized by Gibbs & Hill[15], appear to have obtained PMP data from a publication[16] that, while current at the time of design, is no longer considered acceptable for design use. Present design methodology would obtain data from HMR 51[19] which indicates a 24-hour PMP for the 53.5 square mile watershed would be about 34 inches rather than 30.1 inches. The routing analysis used by the designers was relatively conservative. It also appears that most of the 24-hour rainfall was distributed over the first six hours of the time period. More common practice would use a 24-hour time distribution and concentrate the heaviest rainfall in a second six-hour increment. Even with these conservatisms, the results of the original analyses showed an available freeboard of about 4.5 feet. Law's review of the hydrologic design done during the 1989 inspection concluded that a flood routing using the revised PMP of 34 inches would not result in a predicted overtopping of the dam, although the freeboard might be reduced[1].

2.1.6 Spillway Design

Exhibit 5 shows a plan of the main and emergency spillways located east of the Mayo Creek Dam. The main spillway is a 60-foot wide concrete lined structure consisting of a low ogee overflow weir crest at elevation 434 feet, a chute with vertical sidewalls, and a hydraulic jump stilling basin for energy dissipation. Details of these features are shown in Exhibit 20.

The discharge capacity for the main spillway control structure was calculated by Gibbs & Hill based on the standard weir equation. The "ogee" shape has a coefficient ranging from 3.05 with a head of 0.25 foot to 3.84 for the maximum expected head of 11.5 feet[15].

Main spillway chute flow calculations were made by Gibbs & Hill using the standard step method with an assumed Manning coefficient for concrete lining of 0.012[15]. For the PMP discharge, maximum depths and velocities are 4.9 feet and 30 feet per second just below the crest structure and 2.2 feet and 66 feet per second at the terminal structural entrance.

The emergency spillway is an unlined open channel with crest length of 650 feet and a crest elevation of 437.5 feet. A natural rock embankment is used at the emergency spillway to maintain a uniform positive control at the high point of the channel and to protect the control area against erosion. Cutoffs were required to prevent downstream scour from progressing into the reservoir area.

Discharge calculations by Gibbs & Hill were based on the standard weir equation using a coefficient of 3.0. Results of the normal depth and flow calculation indicate that velocities will range up to 19 to 20 feet per second for the probable maximum flood with flow depth up to 20 feet. Law's inspection report of 1994 concluded the hydraulic designs for the spillway structures appeared to be consistent with accepted engineering practices[2].

Flood routing was done by Gibbs & Hill using the arithmetical trial and error method. For the dam crest elevation at 450 feet, the following results were obtained[15]:

MAXIMUM RESERVOIR	DESIGN STORM		
	100 YEAR	PMP	RECURRENT
Water Elevation, Feet	437.3	445.5	442.45
Normal Spillway discharge, cfs	1200	8,860	5,370
Emergency Spillway discharge, cfs	0	41,250	19,700
Combined discharge, cfs	1200	50,110	25,070

It was noted by Hale and Tice[1] that the maximum reservoir water elevation for the PMP storm in the above Table (445.5 feet) is 0.5 feet above the maximum water level shown on Exhibit 3 (445.0 feet). The source of the different elevations could not be clearly determined; however, the freeboard available for either elevation was judged adequate to provide proper safety protection[1].

United States Geologic Survey gauge records for Mayo Creek just downstream of the spillway indicate a maximum discharge of greater than 2,250 cfs occurred in September 1996 following Hurricane Fran. We are not aware of lake level data corresponding to the maximum discharge.

2.1.7 Grouting Program

2.1.7.1 Main Dam

A grouting program in the dam foundation began in March of 1978. Work was performed by Cunningham Core Drilling Co. The work consisted of constructed a grout curtain by grouting in 3 to 5 lines of holes drilled 50 to 100 feet into rock. Centerline hole spacing varied from 2.5 to 20 feet. Grouting pressures of 1.0 to 4.0 pounds per square inch per foot of depth and mixes as thin as 5:1

(water:cement) were used. Holes with grout takes exceeding 5 bags of cement were bracketed with additional grout holes. Results of the grouting and required pressure tests were reviewed and approved by Gibbs & Hill.

Exhibit 21 shows the grouting plan for the Mayo Creek Dam and associated areas. Exhibit 14 shows the grouting plan in the inactive fault zone. Grouting was performed in accordance with CP&L Specification PPCD-76-S-018.

2.1.7.2 Saddle Dam Station 126+00 - 136+50 and East Abutment

In general, the grouting scheme consisted of constructing a 3-line grout curtain drilled 50 feet into rock from the existing ground surface. Work started by first core drilling, water pressure testing and grouting the centerline or primary holes on 40-foot centers. The primary holes on the upstream and downstream lines were then percussion drilled on 40-foot centers and grouted. Secondary holes were drilled between the primary holes and grouted. Tertiary holes were required for all primary and secondary holes with grout take exceeding 5 bags of cement. In order to verify the effectiveness of grouting, verification holes were core drilled and water pressure tested. Grouting was considered satisfactory when the water pressure testing indicated the grouted rock did not have a flow rate greater than 0.1 gallons per minute to 0.3 gallons per minute.

Based upon the water pressure tests of the centerline core holes, a highly permeable zone existed from 30 to 50 feet. Two 3.25 inch diameter multiple disc rubber packers were attached to the end of 1.5-inch diameter grout supply pipe and set at a depth of 30 feet. Starting with a 3:1 mix and grouting pressure equal to one pound per square inch per foot of depth, the zone was grouted until the grout take was less than one cubic foot in 20 minutes. The packers were then set at 15 feet and the stage grouted. The packers were raised to the bottom of the drill casing and the final stage grouted. Casing was keyed into rock 5 and 10 feet. Holes were backfilled with a thick mix at the completion of grouting.

The grouting program for the east abutment followed the same procedures as the saddle dam except all work began on firm rock. All holes were drilled 50 feet into rock and grouted in 3 stages. Grouting pressures equal to 1.5 pounds per square inch per foot of depth were used.

2.1.7.3 Grouting - Reservoir Drain Pipe Station 118+06 - 118+60

The grouting scheme consisted of constructing a single line grout curtain on each side of the reservoir drain pipe. Grout holes were percussion drilled 25 feet into rock on 50 feet centers in the upstream shell, 10 feet on centers in the core trench and 100 feet on centers in the downstream shell. All grout holes were grouted in 2 stages using grouting pressures equal to 1 pound per square inch per foot of depth. With the exception of the downstream shell, all grout holes with grout takes exceeding 5 bags of cement were bracketed.

2.1.7.4 Grouting - Core Trench Foundation Station 110+50 - 119+00

Grouting of the core trench foundation followed the same procedure as the east abutment and saddle dam. All grout holes were drilled 50 feet into rock and grouted in 3 to 5 stages. A grouting pressure of 1.5 pounds per square inch per foot of depth was used.

Water pressure testing of all the centerline primary holes indicated permeability of the ungrouted rock was nearly equivalent to the required permeability of grouted rock. This low rock permeability resulted in very low grout takes, requiring no tertiary grout holes. Because of the negligible water takes during water pressure testing of the centerline primary holes, it was not necessary to reduce the hole spacing on the centerline to eliminate "windows" in the grout curtain.

2.1.7.5 Grouting - West Abutment

Grouting for the west abutment consisted of stage grouting, incorporating grouting pressures as high as 4 pounds per square inch per foot of depth with grouts as thin as 5:1. The depths of each stage varied, depending on the condition of the rock, water takes during pressure testing, and previous grout takes.

2.1.8 Embankment Construction

Materials for the embankment were placed and compacted in accordance with CP&L Specification PPCD-2383-C-2.1-PI. Initially, core materials were to be compacted to 95 percent of the Modified Proctor maximum dry density within a moisture content range of minus 1 to plus 3 percentage points of the optimum moisture content. This requirement was changed during construction, after evaluation by Gibbs & Hill of alternate borrow materials, to 90 percent and a moisture content up to 6 percentage points above the optimum.

Compaction of random fill materials was controlled by the number of passes of specified construction equipment based on a test strip approach. A minimum dry density of 125 pounds per cubic foot with moisture content in the range of optimum plus or minus 2 percentage points was required.

Granular filter materials were to be compacted to 70 percent relative density. Field density testing results during construction were reviewed and approved by Gibbs & Hill. A cursory review of test results in CP&L files conducted during the 1994 inspection indicates materials placed either met specification requirements initially or after some reworking[2].

2.1.9 Instrumentation

Instrumentation for the Mayo Creek Dam consists of eighteen piezometers, sixteen concrete monuments, and one weir box for monitoring seepage. Locations are shown in Exhibit 22 except for the weir box, which is located 15 feet west of the stilling basin outlet structure, as shown on Exhibit 4. These instruments were installed at the completion of the embankment structure and have been monitored at varying frequencies since.

2.1.9.1 Piezometers

The piezometers consist of standard water level monitoring pipes installed in borings drilled through the embankment into the foundation as shown on Exhibit 23. The piezometer measuring interval is in the foundation as shown on Exhibit 22, Detail A. Therefore, the piezometers do not measure phreatic or uplift conditions in the embankment portion of the dam. Piezometer readings through 1994 have not shown unusual water levels[1, 2, 7].

2.1.9.2 Monuments

Each monument consists of a rock bolt hub drilled into a concrete block cast in the original embankment fill. Some general settlement of the crest was expected during the initial years of operation. As shown on Exhibit 2, this expected settlement was compensated by a 2-foot maximum camber at the crest of the dam. Monuments are located in the upstream and downstream slope as a check for slope movements in either direction. The monuments were first surveyed in April 1981, about 8 months after the embankment was complete and water impoundment begun. It is likely that most of the settlement occurred before the initial monument readings, as there was not evidence of the design camber.

Exhibit 24 contains records of monument measurements up to April 3, 1989 and a summary table. Crest movements had shown negligible settlement; most readings indicated an upward movement of 1 to 2 inches. Both upstream and downstream monuments also had generally shown upward movements of less than 2 inches. Horizontal coordinate changes showed slight movements (1" ±) in a northward direction (downstream) through 1984. The readings obtained in March 1989, showed changes of 4 to 6 inches toward the downstream direction. The 1984 and 1989 easterly horizontal coordinates also showed comparatively large changes with 1984 movements of 4 to 6 inches west and 1989 movements of an additional 2 to 3 inches west.

Hale and Tice[1] noted that, because of the changes in control points that occurred during the surveys, and because of the observed damage to at least one monument (M-10), and also observing that the comparatively large changes are not accompanied by any supporting signs of movement, no high degree of confidence was available that the monument measurements were accurate for evaluating slope and crest movements. Hale and Tice[1] recommended that no further surveys be taken, and none has been taken since 1989.

2.1.9.3 Seepage Monitoring

The seepage flows through the dam exits from the rock toe and is directed by surface grading to a culvert under the roadway near the outlet structure. A weir box located at the downstream end of the culvert, about 15 feet west of the settling basin, allows seepage monitoring.

The weir box has a 90 degree V-notch weir. The location of the box is such that some surface runoff can collect and flow through the box. Flow from the weir box has been reported as clear. Seepage is typically between about 15 and 25 gallons per minute (gpm) and has varied between 11 and 112 gpm.

Higher weir flow volumes tend to occur in winter months and in months of higher rainfall since the weir box unavoidably collects some surface flow.

2.1.10 Maintenance and Repair Activities

Mowing of the dam slopes has taken place on a roughly annual basis. The dam slopes have also been cleared of brush and small trees as needed. Some sections of the downstream slope have been reseeded to deter erosion. Regular maintenance has also included spraying herbicide on the rock toe on the downstream slope and rip rap lining on the upstream slope.

In 1987, the gates in the drawdown structure were repaired, and chipped and cracked concrete in the primary spillway invert was patched. In 1994, brush and small trees were cut from the primary spillway discharge channel. In 1998, brush and trees were cleared from the emergency spillway. In 1999, trees and brush were removed from behind the primary spillway walls. Periodically, missing caulk in primary spillway joints has been replaced.

Spalled concrete was observed in several sections of the primary spillway invert slab in 1997. The worst of these sections, located adjacent to the first slab joint downstream of the ogee section, was repaired in 1997. Specifications and drawings for performing the repairs were developed by CP&L and are included as Appendix B. Several small areas were saw-cut to remove loose concrete. Grout used to patch the saw-cut areas was anchored to the existing slab with anchor bolts. Reinforcing steel was placed in the patches.

2.2 ASH POND DAM

2.2.1 Subsurface Information

2.2.1.1. Foundation Investigation

LETCO conducted subsurface exploration work in 1974 and 1979, drilling 31 borings. Locations are shown on Exhibit 25. Geologic profiles are shown on Exhibits 26 and 27. The borings generally found 4 to 35 feet of residual, slightly sandy silt and saprolite (partially weathered rock) overlying hard rock. Penetration resistances in the soil were usually between 10 and 30 blows per foot while those in the saprolite generally exceeded 100 blows per foot.

The rock is granitic gneiss with some hornblende gneiss and greenstone seams. Recoveries were normally above 80 percent and RQD's were usually greater than 50 percent. Joints and fractures along cleavage planes were not as prevalent as in the Mayo Creek Dam area.

Water pressure tests in 1974 were conducted along a proposed west abutment location that was later abandoned, partly due to indicated moderately high permeabilities. Water pressure tests conducted in several borings along the selected design alignment found the rock to be virtually impermeable. A maximum value of 252 feet per year was found in boring CA-5 where a 1-inch of soft seam was present at a depth of 32.0 feet[20].

2.2.1.2 Borrow Investigations

In 1974, LETCO conducted an investigation of an area located on the western edge of the ash pond reservoir[6] for possible use in the Mayo Creek Dam. Exhibit 25 shows the locations of the borings. The area was ultimately used for the Ash Pond Dam. Exhibit 28 summarizes the soil description and engineering properties of the borrow soils.

2.2.2 Design Information

The Ash Pond Dam was designed by Carolina Power & Light and Mr. William Wells, P.E. Exhibit 6 is a site plan showing the location of the dam. The Ash Pond Dam is an earth dam approximately 90 feet high, 2300 feet long, and 400 feet wide at the base. Exhibit 7 shows a plan and profile of the dam. The crest of the dam is at elevation 490 feet and the normal pond level is elevation 480 feet. Appendix A contains a table that summarizes engineering data for the Ash Pond Dam.

As shown in Exhibit 8, the dam is a random fill embankment with impervious materials placed at the upstream face, a random fill toe, and a sand filter toe drain. Side slopes are 2.5(H):1(V). Slope protection on the upstream slope consists of 18 inches of rip-rap on an 8-inch thick bed of crushed stone. The rip-rap extends for the full height of the slope above elevation 425 feet.

A cutoff trench tied into the impervious layer is provided to sound rock beneath the upstream portion of the dam. The cutoff extends from Station 11+50 to Station 32+00. Beyond the limits of the cutoff trench, near the abutments, upstream blankets of clay are provided, as shown in Exhibits 7 and 8.

A 5-foot wide chimney drain of sand is constructed on a 1:1 slope from the base of the dam to the normal water level elevation. The drain is connected to a horizontal drain blanket that leads to the toe drain system. The toe drain discharges into weir boxes where the seepage flow is monitored. Details of the drainage system are shown in Exhibit 9.

The original design of the downstream face called for seeding only. However, due to a significant amount of erosion of the slope, improvements were made in 1984 that included placing rip-rap on the bottom third of the dam and using soil stabilization fabric in conjunction with seeding on the top two-thirds. These improvements are shown in Exhibits 8 and 9.

The Ash Pond storage capacity and surface area are 4,100 acre-feet and 140 acres, respectively, at a normal pond elevation of 480. The Ash Pond discharge is directed back to the main reservoir by a channel constructed at the northeast corner of the Ash Pond. An earthern dike, with a surface skimmer for containment of ash cenospheres, is located at the entrance to the discharge channel. This dike does not affect the safety of the Ash Pond Dam.

2.2.3 Stability Analysis

A stability analysis was conducted by William L. Wells, P.E., for the design slopes[21]. The results of triaxial shear tests on the borrow material were reviewed by Mr. Wells and he selected the following parameters for use in his analysis:

BORROW MATERIAL TYPE	FRICTION ANGLE	COHESION (psf)
Impervious	24°	0
Random	30°	0

According to Law's calculations, the factors of safety for the downstream slope area as follows:

CASE	FACTOR OF SAFETY
Steady Seepage	1.52
Steady Seepage with Earthquake(a=0.1g)	1.12

Exhibit 29 shows the ten most critical failure surfaces for both cases.

2.2.4 Seepage Analysis

The coefficient of permeability of Stratum A and B material from laboratory tests ranged from 2 x 10^{-7} to 1 x 10^{-9} centimeters per second. To allow for possible horizontal stratification of materials placed in the dam, a design value of 1 x 10^{-6} centimeters per second was selected[20]. A flow net analysis by Wells computed a total amount of seepage through the dam as 15 x 10^{-5} gallons per minute per foot of length of dam and 75 x 10^{-4} gallons per minute per foot through the cutoff trench[22]. The total amount of seepage through the entire length of the dam based on the above numbers was estimated to be 19.5 gallons per minute. The flow measured at the two weirs tends to be between 10 and 20 gallons per minute, which is in good agreement with the estimate by Wells. Hale and Tice[1] noted that Reference 20 reports a total estimated quantity of 2 gpm; the difference has no bearing on dam safety.

In 1979, thirteen piezometers were installed in the upper weathered rock formation around the periphery of the proposed pond to observe the position of the water table in the rock and its seasonable variation. These were observed from August 1979, to at least 1980, and water level in all of them remained above the normal pond elevation of 480 feet[20]. These observations indicated that the reservoir would not cause flow of water into adjacent valleys, but rather that groundwater flow should be into the pond. An exception to the above situation could occur at both abutments of the dam beyond the ends of the cutoff trench. The design included impervious blankets on the upstream side at each abutment to minimize seepage losses.

2.2.5 Discharge Provisions

The ash pond was designed to store the probable maximum flood (PMF). There are no spillways or structures through the dam. According to Hale and Tice[1], calculations in CP&L files show that the design inflow was computed using SCS methods. A 24-hour probable maximum precipitation of 36 inches was used based on Weather Bureau Technical Paper 40[16] and the USBR[17]. Assuming no outflow, and continued discharge of ash effluent into the pond during the design storm, CP&L computed a maximum pond level at elevation 486.0 feet which provides four feet of freeboard.

Current design approaches for PMP use HMR-51[19]. This report indicates the 24-hour PMP for 10 square mile and smaller watersheds is about 39.5 inches. A preliminary calculation by Hale and Tice[1] indicates use of the greater rainfall would result in a revised pond level of about elevation 487.2 feet which was judged to still provide acceptable freeboard (2.8 feet).

Effluent from the ash pond is returned to the main reservoir through a discharge channel on the east side of the reservoir. A small dike with a skimmer structure at an inlet elevation of 480.0 feet controls flow into the discharge channel through a gauging station. A concrete double box culvert located under the railroad embankment carries effluent from the channel to the main reservoir. The culvert discharges into the main reservoir via a trapezoidal channel cut into rock on the west side of the railroad embankment. The channel and culvert are designed to carry flow from the 10-year, 24-hour design storm[20].

2.2.6 Embankment Construction

Construction of the Ash Pond Dam was begun in August of 1981 by the Mason C. Day Company of Danville, Virginia and was completed in October, 1982. Testing and inspection services were provided by S&ME. Construction specifications prepared by CP&L called for compaction of impervious and random fill materials to 95 percent of the standard Proctor maximum dry density in a moisture content range of plus or minus 2 percentage points around the optimum moisture content.

The testing data during construction are contained in a Final Report prepared by S&ME[23]. Due to a lack of sufficient clayey soil, the impervious core width was reduced to 12 feet. Field density testing showed an acceptable degree of compaction was obtained either initially or by reworking areas that initially were below requirements.

Soils used to construct the random fill sections of the dam consisted primarily of fine to coarse sandy silts with mica. Tests of these soils compacted to 95 percent standard Proctor showed permeabilities in the range of 6.55 to 8.35×10^{-6} centimeters per second. Maximum dry densities varied from 94.0 to 124.0 pounds per cubic foot at optimum moisture contents of 25.0 to 9.0 percent, respectively. The majority of the random fill was constructed with soils having maximum dry densities of 100 to 110 pounds per cubic foot at optimum moisture contents of 22.0 to 15.0 percent. Sand from the Dan River in Halifax County, Virginia was used for all three components of the drain system. The permeability of the sand at 100 percent relative density was 1.1×10^{-2} centimeters per second. To reduce the potential for fines migrating from the random fill into the filter, silty, medium to coarse sand with rock was placed for a width of 10 feet on the upstream edge of the chimney drain[23].

2.2.7 Instrumentation

Instrumentation for the Ash Pond Dam consists of embankment piezometers at four locations and a seepage collection system with two outlet boxes. Exhibits 30 and 31 show piezometer locations and installation details. The embankment piezometers were constructed in pairs with one extending into the foundation rock and the other stopping in the random fill above the horizontal drain blanket leading to a total of eight piezometers at four locations. If the drainage system is functioning in accordance with the design, the shallow piezometer of each pair should remain dry to the elevations shown in Exhibit 31.

CP&L personnel check water levels in the piezometers semi annually, perform visual inspections of the slopes monthly, and record seepage flow rates at the weir boxes quarterly. Personnel from the Fossil Plant Betterment Department, Engineering Section, perform an annual inspection and prepare an annual report.

The weir flows have shown some variations with seasons and rainfall, but the total seepage volume has generally been in the range of 10 to 20 gallons per minute, consistent with design estimates. The water elevations in the deep piezometers AP1 and AP4 have generally been a few feet above the elevations in the corresponding shallow piezometers. This indicates that a hydraulic gradient is present and that the internal drainage blanket is relieving pressures in the foundation materials at these locations.

2.2.8 Maintenance and Repair Activities

Mowing of the dam slopes has taken place on a roughly annual basis. The dam slopes have also been cleared of brush and small trees as needed. Regular maintenance has also included spraying herbicide on the downstream rock toe and upstream rip rap lining.

The original design of the downstream face called for seeding only. However, due to a significant amount of erosion of the slope, improvements were made in 1984 that included placing rip rap on the bottom third of the dam and using soil stabilization fabric in conjunction with seeding on the top two-thirds. These improvements are shown in Exhibits 8 and 9.

In 1988, the seepage weir discharge pipes were cleaned of sediment. In 1993, the V-notch weir plates were removed and a bucket and stop-watch method of measuring seepage flow was substituted for the weir plate measurement procedure.

REFERENCES

1. "Carolina Power & Light Company, Mayo Steam Electric Plant, Mayo Creek Dam, Ash Pond Dam, Five Year Independent Consultant Inspection", by Barney C. Hale, P.E. and J. Allan Tice, P.E., Law Engineering, Inc., September, 1989.

2. "Carolina Power & Light Company, Mayo Steam Electric Plant, Mayo Creek Dam, Ash Pond Dam, Five Year Independent Consultant Inspection", by Mohsen Sefat, E.I.T. and Clay E. Sams, P.E., Law Engineering, Inc., November 1994.

3. "Phase II Site Feasibility Study", Mayo Creek, North Carolina, Carolina Power & Light Company, November 1973.

4. "Recommended Guidelines for Safety Inspections of Dams", U.S. Army, Corps of Engineers, Office of Chief Engineer, Washington, D.C., 1976.

5. "Report of Subsurface Investigation, Mayo Creek Site, Person County, North Carolina", Law Engineering Testing Company, November 26, 1973.

6. "Final Report, Subsurface Investigation Mayo Electric Generating Plant", Law Engineering Testing Company, December 13, 1974.

7. "Safety Inspection of Mayo Creek Dam and Ash Pond Dam", Ralph E. Fadum Consulting Engineer, November 1984.

8. "Report on Inactive Fault Zone in Upstream Shell Foundation", Gibbs & Hill, December 28, 1978.

9. "Earthquake Design and Analysis for Corps of Engineers Projects", ER1110-2-1806, Corps of Engineers, Office of the Chief of Engineers, Washington, D.C., 20314.

10. "Summary of Investigation Foundation Faulting Mayo Creek Dam", Law Engineering Testing Company, October 18, 1974.

11. "Report of Supplementary Borrow Investigation - Mayo Electric Generating Plant", Law Engineering Testing Company, March 14, 1977.

12. "Mayo Creek Dam, Report on Study of Impervious Core Material", Gibbs & Hill Inc., October 25, 1978.

13. "Core-Filter Compatibility Test", Mayo Creek Dam, GAI-Consultants, Inc., May 1979.

14. "Environmental Impact Statement", U.S. Army Corp of Engineers, Wilmington, North Carolina, September 1978.

15. "Mayo Reservoir Spillways, Hydrology and Spillways (Rough Draft)", Gibbs & Hill, Inc., March 8, 1978.

16. "U.S. Department of Commerce, Weather Bureau Technical Paper Number 40, Rainfall Frequency Atlas of U.S.", Washington, D.C. 1961.

17. "Design of Small Dams, U.S. Bureau of Reclamation", Washington, D.C., 1973.

18. "Flood Study, Mayo Creek Dam", Lockwood Greene, November 25, 1974.

19. "Probable Maximum Precipitation Estimates, United States East of the 105th meridian", Hydrometeorlogical Report No. 51, U.S. Department of Commerce, Washington, D.C. 1978.

20. "Ash Pond Dam Design Report on Foundation Investigations and Stability Analysis", Carolina Power & Light Company, June 1980.

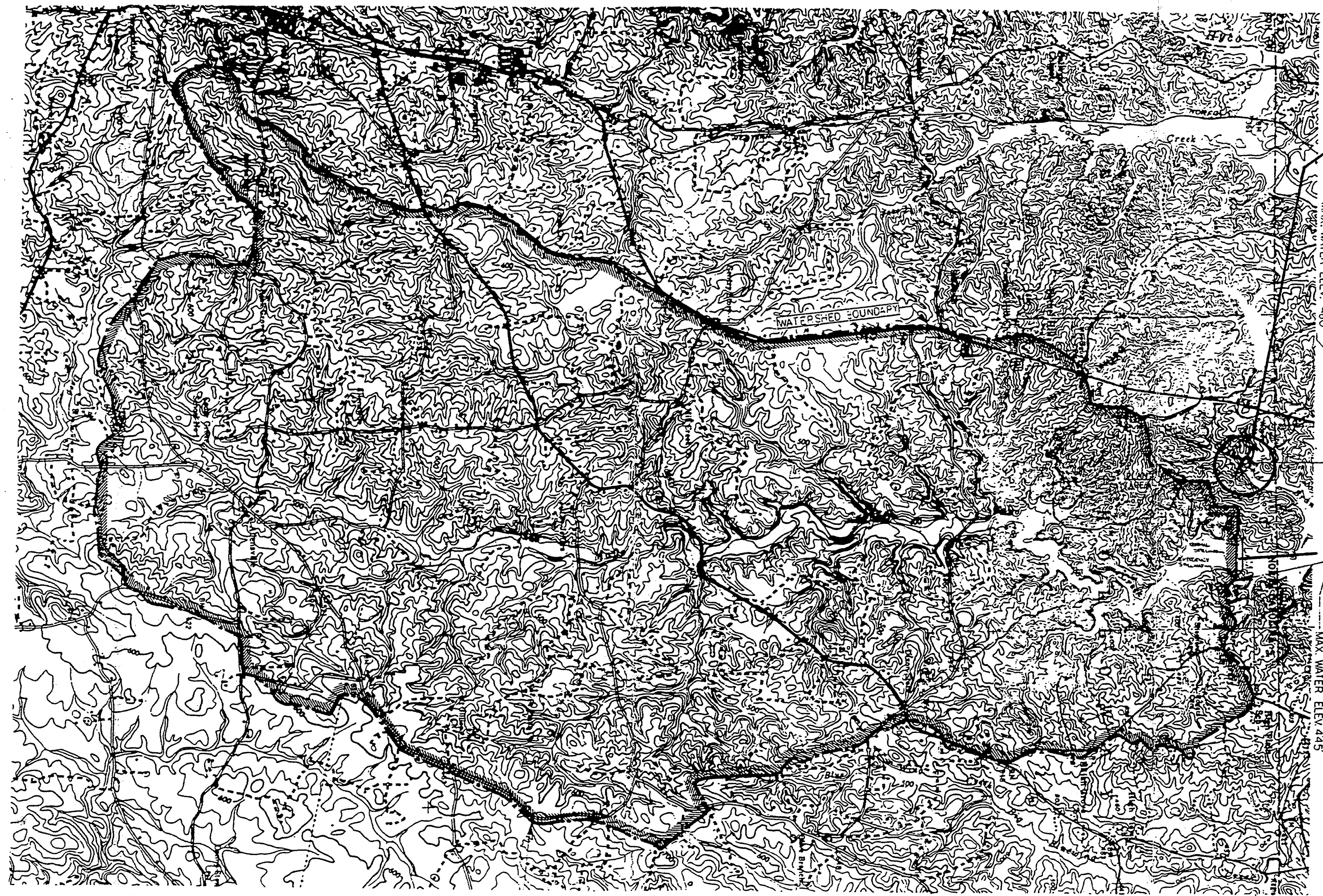
21. "Mayo Ash Pond Dam, Stability of Slopes", letter from William Wells, December 13, 1978.

22. "Mayo Creek Ash Pond, Flow Net", Letter from William Wells, July 24, 1980.

23. "Final Report Ash Pond Dam", Soil and Material Engineers, Inc., to Carolina Power & Light Company, dated December 21, 1982.

EXHIBITS

1. Mayo Creek Dam Reservoir and Water Shed Area - Gibbs & Hill Drawing S-0001.
2. Mayo Creek Dam Plan & Profile - Gibbs & Hill Drawing S-0009.
3. Mayo Creek Dam Typical Design Sections of Embankment - Gibbs & Hill Drawing S-0010.
4. Mayo Creek Dam Outlet Works General Plan & Sections - Gibbs & Hill Drawing S-0043.
5. Mayo Creek Dam Plan of Spillways - Gibbs & Hill Drawing S-0030.
6. Mayo E. G. P. - Ash Pond Dam Site Plan CP&L Drawing RCD-1580.
7. Mayo E. G. P. - Ash Pond Dam Plan & Profile - CP&L Drawing RCD-1584.
8. Mayo E. G. P. – Ash Pond Dam Typical Design Section - CP&L Drawing RCD-1585, Rev. 7.
9. Mayo Electric Generating Plant - Ash Pond Dam - Drainage Improvements and Seeding Plan - CP&L Drawing D-3685, Revision 4.
10. Table - Summary of Information, Materials from Plant Grading - Mayo Electric Generating Plant.
11. Mayo Creek Dam & Reservoir As-Drilled Boring Plan - Gibbs & HIll Drawing S-0004.
12. Mayo Creek Dam Generalized Geologic Cross Section - Section A-A - Gibbs & Hill Drawing S-0021.
13. Mayo Creek Dam Generalized Geologic Cross Sections - Section B-B & C-C - Gibbs & Hill Drawing S-0022.
14. Mayo Creek Dam Treatment of Foundation at Inactive Fault Zone - Gibbs & Hill Drawing S-0017.
15. Borrow Pit Investigation – Main Dam Site.
16. Summary of Laboratory Test Data - Gibbs & Hill Drawing S-0029.
17. Mayo Creek Dam Stability Analysis Upstream Slope Sh. 1 - Gibbs & Hill Drawing S-0025.
18. Mayo Creek Dam Stability Analysis Upstream Slope Sh. 2 - Gibbs & Hill Drawing S-0026.
19. Mayo Creek Dam Stability Analysis Downstream Slope - Gibbs & Hill Drawing S-0027.
20. Mayo Creek Dam Normal Spillway Grading Details - Gibbs & Hill Drawing S-0032.



REFERENCE DRAWINGS AND SPECIFICATIONS

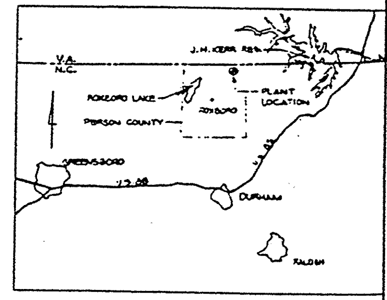
FOR LIST OF REFERENCE DRAWINGS AND SPECIFICATIONS SEE DWG. NO. [illegible]

LEGEND

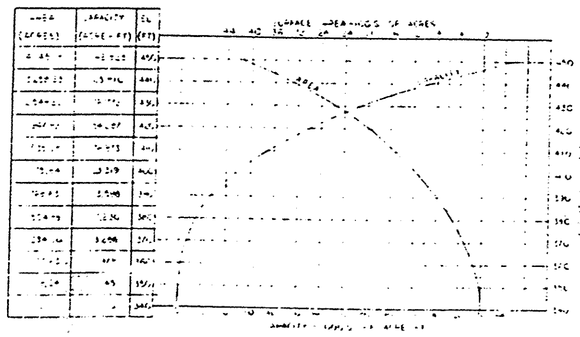
— RESERVOIR WATER SURFACE

— WATERSHED BOUNDARY

SCALE



VICINITY MAP



MAYO CREEK AREA CAPACITY CURVE

MAYO CREEK RESERVOIR

TOP OF DAM (FT)	[illegible]
NORMAL POOL ELEV. (FT)	[illegible]
NORMAL LAKE SURFACE (ACRES)	[illegible]
MAXIMUM POOL ELEV. (FT)	[illegible]
MAXIMUM LAKE SURFACE (ACRES)	[illegible]
DRAINAGE BASIN (SQ. MI)	[illegible]

NOTES

1. CONTOUR INTERVAL IS 20 FEET
2. DATUM IS MEAN SEA LEVEL
3. TOPOGRAPHY TAKEN FROM U.S.G.S. MAPS:
   ROXBORO, N.C. 1943
   SOUTH BOSTON, VA. 1957

EXHIBIT 1

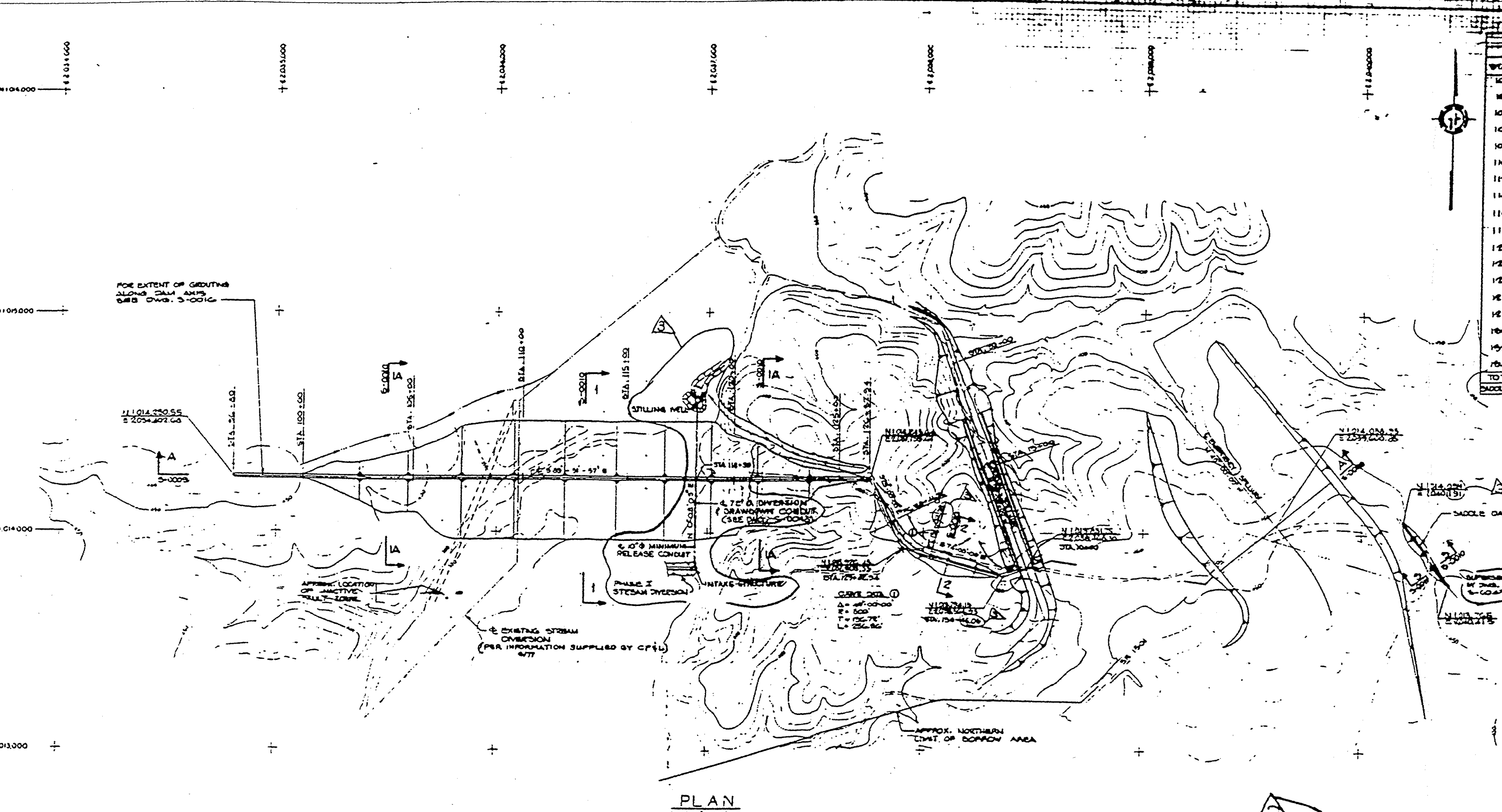
CAROLINA POWER & LIGHT COMPANY
MAYO ELECTRIC GENERATING PLANT
1983-85-1,500,000 KW INSTALLATION
UNITS 1 & 2

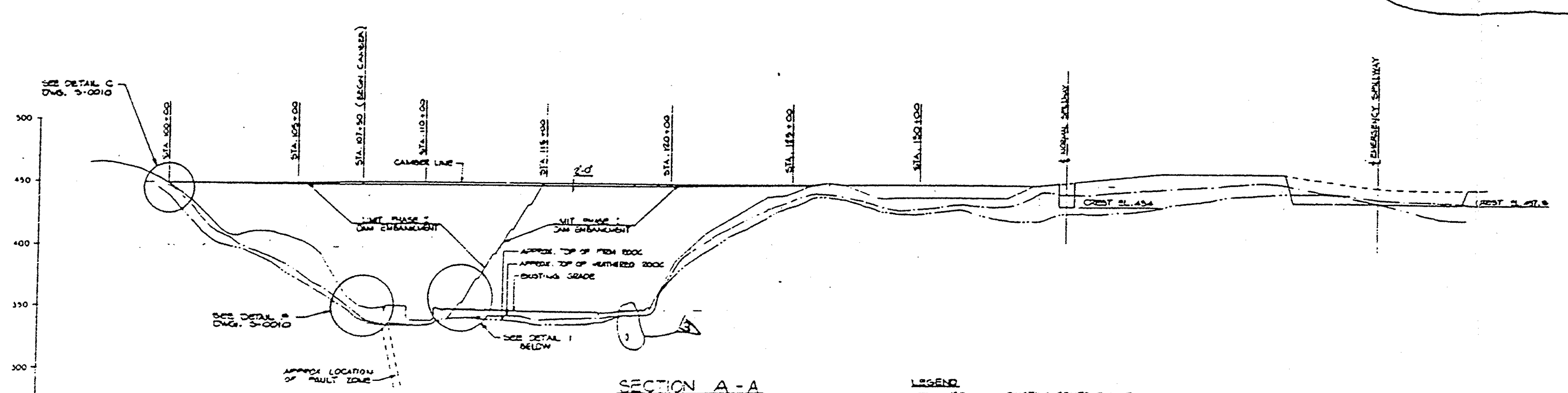
MAYO CREEK DAM RESERVOIR AND WATERSHED AREA

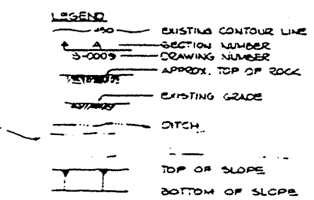
CONSTRUCTION

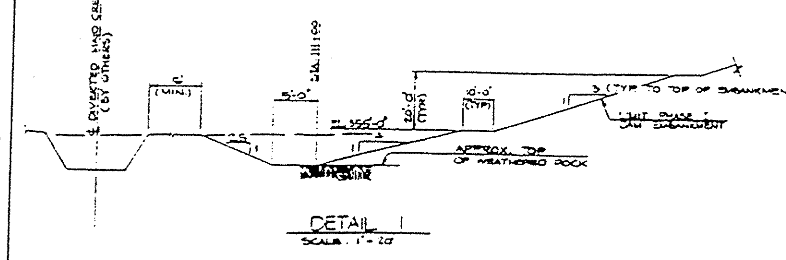
AS SHOWN

S-0001









MAIN DAM EMBANKMENT QUANTITIES (IN-PLACE COMPACTED VOLUME) C.Y.

STATION	[illegible]	EMBANKMENT: RIP-RAP	RIP-RAP BEDDING	FILTER C_1	CORE	RANDOM FILL	EXCAVATION: WEATHERED ROCK	EARTH
100+00	—	1,474	495	2,022	6,070	12,426	1,704	11,770
102+00	—	2,770	906	6,022	16,878	41,244	3,090	44,156
104+00	—	2,926	978	9,169	30,910	90,244	4,259	73,741
106+00	2940 / 115	2,926	3,322	11,605	49,126	146,396	9,296	75,311
108+00	4167 / 131	2,926	13,004	12,941	56,644	170,108	8,348	66,259
110+00	5063 / 119	2,926	12,925	12,822	52,770	167,801	4,480	58,335
112+00	5700 / 119	2,926	11,841	12,689	50,685	165,665	4,919	43,167
114+00	4504 / 113	2,926	10,401	12,600	49,397	160,141	4,117	34,804
116+00	3449 / 119	2,926	8,364	12,466	48,370	159,308	4,437	31,267
118+00	1927 / 47	2,926	1,558	11,395	35,695	120,246	3,630	30,565
120+00	—	2,926	974	7,578	16,041	55,448	2,178	19,000
122+00	—	2,168	775	3,956	6,959	20,441	1,984	16,370
124+00	—	1,178	365	1,254	2,222	4,156	1,119	6,778
126+00	—	767	244	—	—	2,674	—	3,165
128+00	—	886	280	—	—	4,074	—	3,337
130+00	—	1,055	341	—	—	6,030	—	3,544
132+00	—	970	315	—	—	4,674	—	3,315
134+00								
TOTAL	1759 / 773	57,845	67,129	116,141	421,858	1,325,474	55,217	535,278
SADDLE DAM	—	—	—	—	—	3,785	—	2,770

FOR ADDITIONAL QUANTITIES SEE DWG. S-0016

REFERENCE SPECIFICATIONS:

- PPCD-74-S-001 CLEARING & GRUBBING RESERVOIR
- C-1.4-P3 EXCAVATION & BACKFILL FOR MAYO CREEK DAM NORMAL SPILLWAY
- C-21-P1 TECHNICAL SPECIFICATION FOR CONSTRUCTION OF MAYO CREEK DAM
- C-21-P2 LOW LEVEL RELEASE PIPE, VALVES, & APPURTENANCES
- C-21-P3 CONSTRUCTION STAGE BY-PASS CONDUIT
- C-42-P1 REINFORCING STEEL
- C-44-P1 MISCELLANEOUS STEEL
- C-52-P1 CONCRETE CONSTRUCTION
- ~~PPCD-77-P-301 BYPASS CONDUIT ... PROCEDURES~~ — VOID

3

REFERENCE DRAWINGS:

DWG. NO.	DRAWING TITLE
S-0001	MAYO CREEK DAM RESERVOIR & WATERSHED AREA
S-0002	MAYO CREEK DAM & RESERVOIR CLEARING & GRUBBING PLAN
S-0003	MAYO CREEK DAM & RESERVOIR - BORING PLAN
S-0004	MAYO CREEK DAM & RESERVOIR - AS DRILLED BORING PLAN
S-0005	INDEX OF BORINGS & TEST PITS
* ~~S-0007~~	~~MAYO CREEK DAM CONSTRUCTION STAGE ...~~ (SUPERSEDED BY DWG. S-0043)
* S-0009	MAYO CREEK DAM - PLAN & PROFILE
S-0010	MAYO CREEK DAM - TYPICAL DESIGN SECTION OF EMBANKMENT
S-0011	MAYO CREEK DAM - EMBANKMENT CROSS SECTIONS STA. 100+00 TO STA. 108+00
S-0012	MAYO CREEK DAM - EMBANKMENT CROSS SECTIONS STA. 110+00 TO STA. 114+00
S-0013	MAYO CREEK DAM - EMBANKMENT CROSS SECTIONS STA. 116+00 TO STA. 120+00
S-0014	MAYO CREEK DAM - EMBANKMENT CROSS SECTIONS STA. 122+00 TO STA. 134+00
* S-0016	MAYO CREEK DAM - GROUTING PLAN
S-0017	MAYO CREEK DAM - TREATMENT OF FOUNDATION AT INACTIVE FAULT ZONE
S-0018	MAYO CREEK DAM - DRAINAGE SYSTEM
S-0021	MAYO CREEK DAM - GENERALIZED GEOLOGIC CROSS SECTIONS SH. 1
S-0022	MAYO CREEK DAM - GENERALIZED GEOLOGIC CROSS SECTIONS SH. 2
S-0025	MAYO CREEK DAM - STABILITY ANALYSIS UPSTREAM SLOPE SH. 1
S-0026	MAYO CREEK DAM - STABILITY ANALYSIS UPSTREAM SLOPE SH. 2
S-0027	MAYO CREEK DAM - STABILITY ANALYSIS DOWNSTREAM SLOPE
S-0029	SUMMARY OF LABORATORY TEST DATA
* S-0030	MAYO CREEK DAM - PLAN OF SPILLWAYS
S-0031	MAYO CREEK DAM - EMERGENCY SPILLWAY GRADING DETAILS
S-0032	MAYO CREEK DAM - NORMAL SPILLWAY GRADING DETAILS
S-0033	MAYO CREEK DAM - NORMAL SPILLWAY PLAN & PROFILE
S-0035	MAYO CREEK DAM - NORMAL SPILLWAY SECTIONS & DETAILS
S-0037	MAYO CREEK DAM - NORMAL SPILLWAY WALL ELEVATIONS & DETAILS
* ~~S-0040~~	~~MAYO CREEK DAM - LOW LEVEL RELEASE SYSTEM PLAN, PROFILE & DETAILS~~
~~S-0041~~	~~MAYO CREEK DAM - LOW LEVEL RELEASE INTAKE & DISCHARGE STRUCTURE~~
~~S-0042~~	~~MAYO CREEK DAM - LOW LEVEL RELEASE INTAKE & DISCHARGE STRUCT. MISC. STEEL~~
* S-0043	MAYO CREEK DAM - OUTLET WORKS - GENERAL PLAN & SECTIONS.
S-0044	MAYO CREEK DAM - OUTLET WORKS - CONDUITS & ENTRANCE CHANNEL DETAILS.
S-0045	MAYO CREEK DAM - OUTLET WORKS - DISCHARGE GRADING SECTIONS & DETAILS.
S-0046	MAYO CREEK DAM - OUTLET WORKS - INTAKE STRUCTURE.
S-0047	MAYO CREEK DAM - OUTLET WORKS - STILLING WELL & DISCHARGE STRUCTURE.
S-0048	MAYO CREEK DAM - OUTLET WORKS - MISCELLANEOUS STEEL.

3

SUPERSEDED BY DWGS. S-0043 THRU S-0048

* INDICATES DWG. WITH QUANTITIES SUMMARIZED

GENERAL NOTES:

1. CONTOUR INTERVAL IS 10 FEET
2. ELEVATIONS REFER TO MEAN SEA LEVEL 1929
3. HORIZONTAL DATUM BASED ON NORTH CAROLINA STATE PLANE COORDINATE SYSTEM.
4. TOPO BASED ON SURVEY BY MOORE, GARDNER & ASSOCIATES INC., DATED MAY 1976
5. THE LINES INDICATING TOP OF WEATHERED ROCK & TOP OF FIRM ROCK ON SECTION A-A ARE GENERALIZED FROM & INTERPOLATED BETWEEN THE TEST BORINGS. IT IS POSSIBLE THAT SUBSURFACE CONDITIONS BETWEEN THE TEST BORINGS MAY VARY FROM THOSE INDICATED.
6. QUANTITIES SUMMARIZED ON DRAWINGS ARE ESTIMATED. ACTUAL NET QUANTITIES SHALL BE DETERMINED IN THE FIELD.

EXHIBIT 2

4	AS-BUILT
3	REVISED ...
2	...
1	...
0	CONSTRUCTION
B	BIDS
A	CLIENT'S REVIEW

CAROLINA POWER & LIGHT COMPANY
MAYO ELECTRIC GENERATING PLANT
1983-85-1,500,000 KW INSTALLATION
UNITS 1 & 2

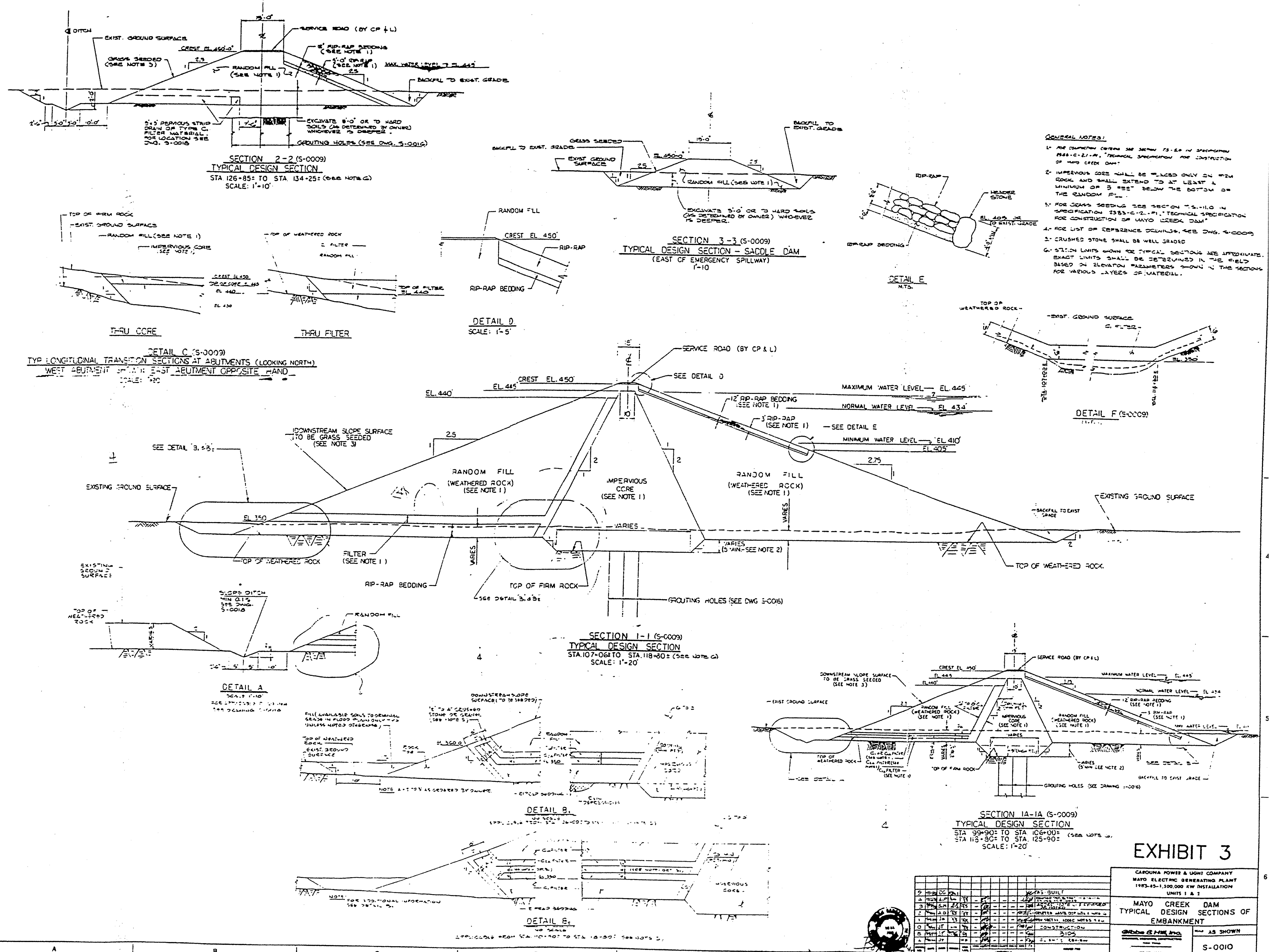
MAYO CREEK DAM
PLAN & PROFILE

Gibbs & Hill, Inc.

SCALE AS SHOWN

S-0009

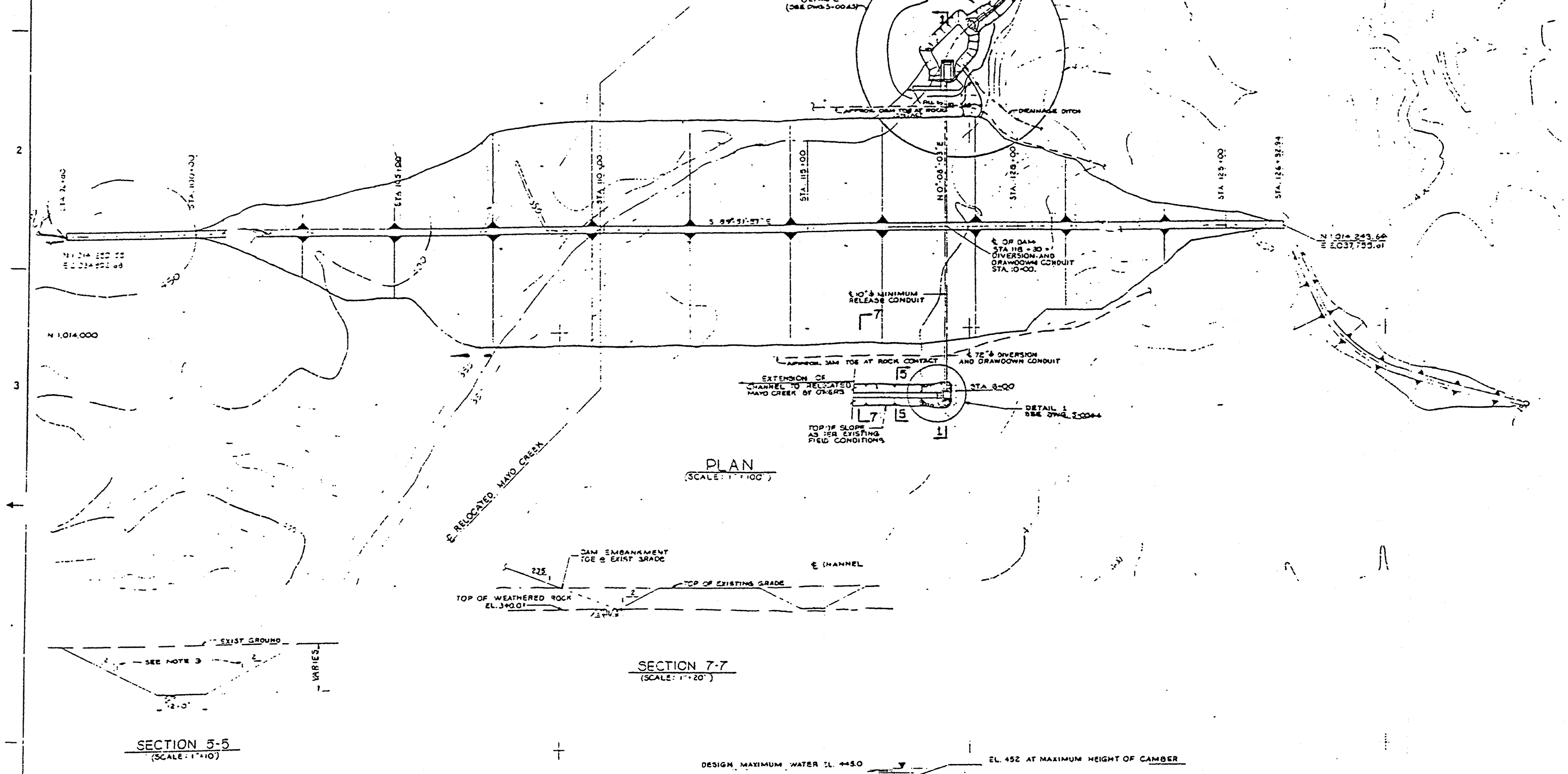
S-0102, S-0104

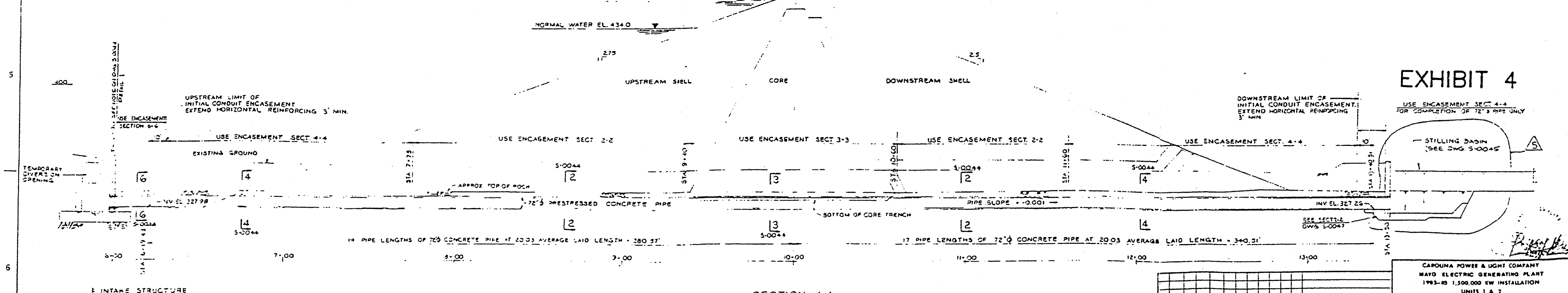


SECTION 2-2 (S-0009)
TYPICAL DESIGN SECTION
STA 126+85± TO STA 134+25± (SEE NOTE 6)
SCALE: 1"=10'
SERVICE ROAD (BY CP & L)
EXIST. GROUND SURFACE
GRASS SEEDED (SEE NOTE 3)
CREST EL 450.0'
RANDOM FILL (SEE NOTE 1)
MAX. WATER LEVEL EL 445'
BACKFILL TO EXIST. GRADE
GROUTING HOLES (SEE DWG. S-0016)
SECTION 3-3 (S-0009)
TYPICAL DESIGN SECTION - SADDLE DAM
(EAST OF EMERGENCY SPILLWAY)
1"=10
DETAIL E
N.T.S.
RIP-RAP
HEADER STONE
RIP-RAP BEDDING
GENERAL NOTES:
1- FOR COMPACTION CRITERIA SEE SECTION TS-5.0 IN SPECIFICATION 2383-C-2.1-M, "TECHNICAL SPECIFICATION FOR CONSTRUCTION OF MAYO CREEK DAM"
2- IMPERVIOUS CORE SHALL BE PLACED ONLY ON FIRM ROCK AND SHALL EXTEND TO AT LEAST A MINIMUM OF 5 FEET BELOW THE BOTTOM OF THE RANDOM FILL.
3- FOR GRASS SEEDING SEE SECTION TS-11.0 IN SPECIFICATION 2383-C-2.1-M, "TECHNICAL SPECIFICATION FOR CONSTRUCTION OF MAYO CREEK DAM"
4- FOR LIST OF REFERENCE DRAWINGS, SEE DWG. S-0009
5- CRUSHED STONE SHALL BE WELL GRADED
6- STATION LIMITS SHOWN FOR TYPICAL SECTIONS ARE APPROXIMATE. EXACT LIMITS SHALL BE DETERMINED IN THE FIELD BASED ON ELEVATION PARAMETERS SHOWN IN THE SECTIONS FOR VARIOUS LAYERS OF MATERIAL.
THRU CORE
THRU FILTER
DETAIL C (S-0009)
TYP LONGITUDINAL TRANSITION SECTIONS AT ABUTMENTS (LOOKING NORTH)
DETAIL D
SCALE: 1"=5'
CREST EL 450'
RIP-RAP BEDDING
DETAIL F (S-0009)
SERVICE ROAD (BY CP & L)
SEE DETAIL D
MAXIMUM WATER LEVEL EL. 445
NORMAL WATER LEVEL EL. 434
12" RIP-RAP BEDDING (SEE NOTE 1)
3' RIP-RAP (SEE NOTE 1)
SEE DETAIL E
MINIMUM WATER LEVEL EL. 410
EL. 405
DOWNSTREAM SLOPE SURFACE TO BE GRASS SEEDED (SEE NOTE 3)
RANDOM FILL (WEATHERED ROCK) (SEE NOTE 1)
IMPERVIOUS CORE (SEE NOTE 1)
EXISTING GROUND SURFACE
FILTER (SEE NOTE 1)
TOP OF WEATHERED ROCK
RIP-RAP BEDDING
TOP OF FIRM ROCK
GROUTING HOLES (SEE DWG S-0016)
SECTION 1-1 (S-0009)
TYPICAL DESIGN SECTION
STA. 107+06± TO STA. 118+80± (SEE NOTE 6)
SCALE: 1"=20'
DETAIL A
DETAIL B1
DETAIL B2
SECTION 1A-1A (S-0009)
TYPICAL DESIGN SECTION
STA 99+90± TO STA 106+00± (SEE NOTE 6)
STA 118+80± TO STA 125+90±
SCALE: 1"=20'
EXHIBIT 3
CAROLINA POWER & LIGHT COMPANY
MAYO ELECTRIC GENERATING PLANT
1983-85-1,500,000 KW INSTALLATION
UNITS 1 & 2
MAYO CREEK DAM
TYPICAL DESIGN SECTIONS OF EMBANKMENT
AS-BUILT
CONSTRUCTION
Gibbs & Hill, Inc.
AS SHOWN
S-0010

HYDROLOGIC DATA FOR MAYO CREEK DIVERSION					
ITEM			STORM FREQUENCY		
			1 YR	10 YR	25 YR
	FLOOD INFLOW	24 HR PT/AREAL RAINFALL	3" / 2.88"	3.5" / 3.2"	6.5" / 6.2
		24 HR RUNOFF INCH/AC.FT.	0.4 / 1170	1.6 / 4568	2.3 / 6330
		PEAK INFLOW C.F.S.	1500	3800	8000
PHASE II EMBANKMENT	OUTFLOW ROUTED THROUGH 72"Φ CONCRETE PIPE	MAX. WATER SURFACE EL.	358	371	376
		DAYS TO DISCHARGE	3	5	7
		MAX. DISCHARGE - C.F.S.	450	630	660
PHASE I EMBANKMENT	MAX. WATER SURFACE EL. AT DAM WITH DISCHARGE THROUGH 300' WIDE OPEN CHANNEL.		351	365	356

ABOVE ELEVATIONS BASED ON VALLEY FLOOR ELEVATION OF 350





SECTION 1-1
(SCALE 1" = 20')

NOTE
FOR PRESSURE GROUTING ALONG THE DRAWDOWN PIPE SEE NOTE 10.

OUTLET WORKS ESTIMATED QUANTITES				
ITEM	DESCRIPTION	UNIT	QUANTITY	REMARKS
1.0	EXCAVATION			
1.1	EARTH	CY	17,200	INCLUDES INTAKE TOWER, DRAWDOWN CONDUIT & DISCHARGE STRUCTURE BUT DOES NOT INCLUDE APPROACH CHANNEL
1.2	ROCK	CY	2,700	
2.0	FILL		VOID	
2.1	ORDINARY	CY	1,300	DISCHARGE STRUCTURE
2.2	RIPRAP BEDDING	CY	2,600	WORKS & DISCHARGE STRUCT.
2.3	RIPRAP	CY	1,000	" " "
3.0	PIPES			
	72"Φ	L.FT.	750	
	10"Φ	L.FT.	800	
	6"Φ	L.FT.	130	
4.0	CONCRETE			
4.1	LEAN CONCRETE	CY		
4.2	4000 PSI	CY	4000	DRAWDOWN PIPE ENCASEMENT
4.3	4000 PSI	CY	1220	INTAKE STRUCTURE
4.4	4000 PSI	CY	540	DISCHARGE STRUCTURE
5.0	REBARS		VOID	
5.1	#8	TNS	130	DRAWDOWN PIPE ENCASEMENT
5.2	#6	"	40	
5.3	#14	"	3.7	INTAKE STRUCTURE
5.4	#11	"	39.5	
5.5	#9	"	29.1	
5.6	#8	"	36.3	
5.7	#6	"	16.6	
5.8	#5	"	1.6	
5.9	#4	"	2.5	
5.10	#10	"	1.6	DISCHARGE STRUCTURE
5.11	#8	"	31.6	
5.12	#7	"	6.0	
5.13	#6	"	3.6	
5.14	#5	"	0.00	
5.15	#4	"	1.03	

ALL QUANTITIES ARE ESTIMATED - NET BY FIELD. EXCAVATION AND FILL QUANTITIES ARE IN-PLACE COMPACTED VOLUMES.

REFERENCE SPECIFICATIONS

C-2.1-P2 LOW LEVEL RELEASE PIPE, VALVES AND APPURTENANCES.
C-2.1-P1 TECHNICAL SPECIFICATION FOR CONSTRUCTION OF MAYO CREEK DAM
C-4.2-P1 REINFORCING STEEL
C-4.4-P1 MISCELLANEOUS STEEL
C-3.2-P1 CONCRETE CONSTRUCTION

REFERENCE DRAWINGS

S-0009 MAYO CREEK DAM PLAN & PROFILE
S-0010 MAYO CREEK DAM TYPICAL DESIGN SECTION OF EMBANKMENT
S-0013 MAYO CREEK DAM EMBANKMENT CROSS SECTIONS STA 116+00 TO STA 120+00.
S-0018 MAYO CREEK DAM GROUTING PLAN
S-0044 MAYO CREEK DAM OUTLET WORKS CONDUITS AND ENTRANCE CHANNEL DETAILS.
S-0045 MAYO CREEK DAM OUTLET WORKS DISCHARGE GRADING SECTIONS & DETAILS.
S-0046 MAYO CREEK DAM OUTLET WORKS - INTAKE STRUCTURE
S-0047 MAYO CREEK DAM OUTLET WORKS STILLING WELL & DISCHARGE STRUCTURE.
S-0048 MAYO CREEK DAM OUTLET WORKS MISCELLANEOUS STEEL

GENERAL NOTES

1- CONTOUR DATA TAKEN FROM TOPOGRAPHIC MAPS BY MOORE, GARDNER & ASSOCIATES, INC. DATED NOVEMBER, 1976.

2- HORIZONTAL DATUM IS BASED ON NORTH CAROLINA STATE PLANE COORDINATE SYSTEM.

3- ELEVATIONS REFER TO MEAN SEA LEVEL 1929.

4- CONTOUR INTERVAL IS 10 FEET.

5- TOP OF WEATHERED ROCK & TOP OF FIRM ROCK ELEVATIONS SHALL BE DETERMINED IN THE FIELD.

6- FOR MINIMUM RELEASE CONDUIT MATERIAL SPECIFICATION SEE SPECIFICATION C-2.1-P2.

7- FOR CONDUIT INSTALLATION SPECIFICATIONS SEE SPECIFICATION C-2.1-P1.

8- FOR 72"Φ PIPE MATERIAL SPECIFICATION SEE PRICE BROTHERS COMPANY DESIGN SHEET NO. 72.788-1.
FOR 72"Φ PIPE TESTABLE JOINT DETAIL SEE PRICE BROTHERS COMPANY DRAWING NO. 72.788-2.

9- EXCAVATION SHALL CONFORM TO THE REFERENCE SPECIFICATIONS AND DRAWINGS. INCLINATION OF EXCAVATED SLOPES AND CHANNEL SECTION SHALL BE FLATTENED WHERE REQUIRED FOR STABILITY.

10- A SYSTEM OF PRESSURE GROUTING ALONG THE DRAWDOWN PIPE SHALL BE IMPLEMENTED AFTER PIPE INSTALLATION AND ENCASEMENT. THE MINIMUM REQUIRED SYSTEM SHALL CONSIST OF GROUT HOLES THROUGH AND ADJACENT TO THE CONCRETE ENCASEMENT AT 100' CENTERS IN THE DOWNSTREAM SHELL, 50' ON CENTERS IN THE UPSTREAM SHELL, AND 10' ON CENTERS IN THE CORE TRENCH. DEPTHS AND ANY ADDITIONAL GROUT HOLES SHALL BE AS ORDERED BY THE OWNER.

EXHIBIT 4

6		AS-BUILT
5		REV. STILLING BASIN
4		[illegible]
3		[illegible]
2		[illegible]
1		[illegible]
0		[illegible]

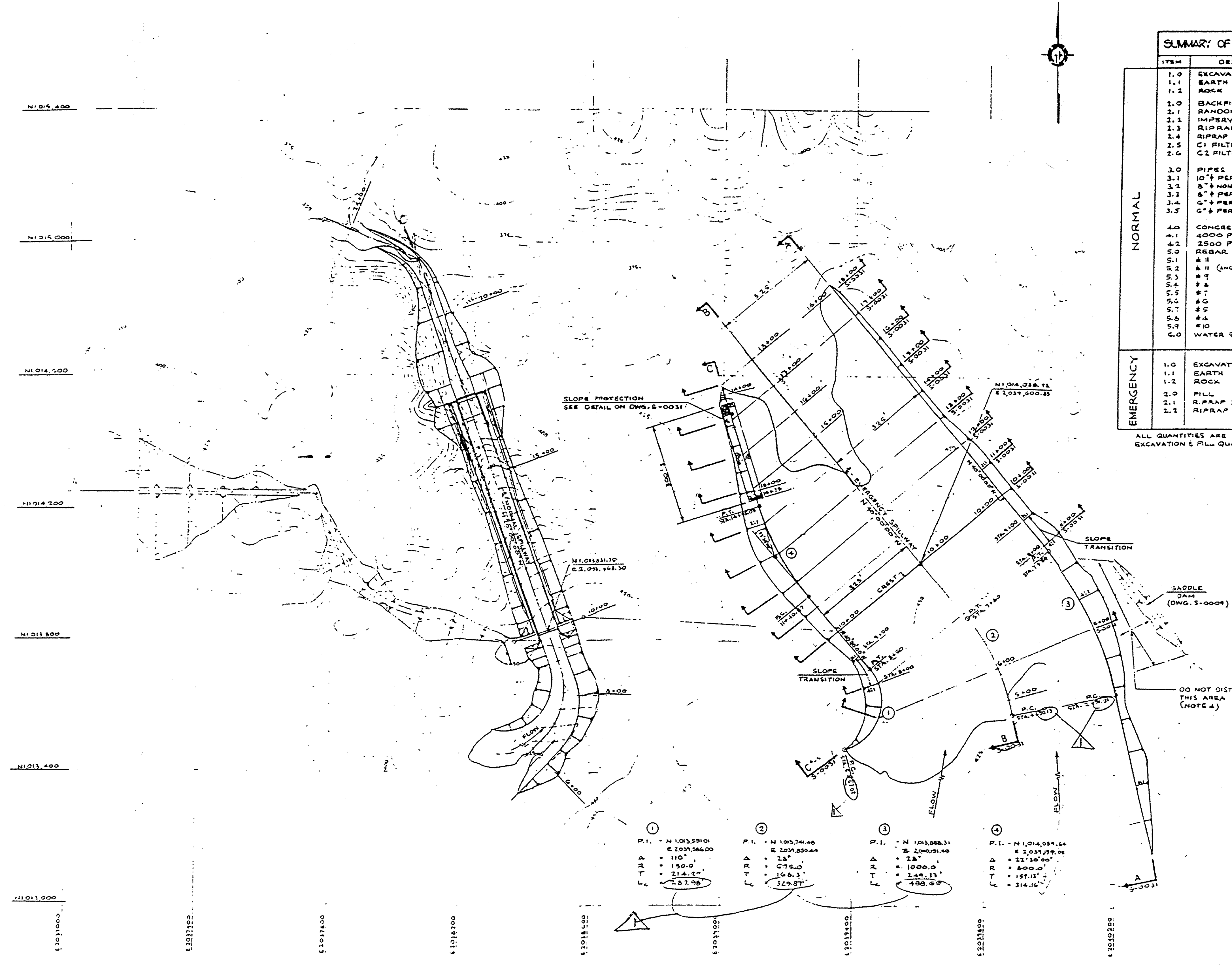
CAROLINA POWER & LIGHT COMPANY
MAYO ELECTRIC GENERATING PLANT
1983-85 1,500,000 KW INSTALLATION
UNITS 1 & 2

MAYO CREEK DAM
OUTLET WORKS
GENERAL PLAN & SECTIONS

Gibbs & Hill, Inc.

SCALE AS SHOWN

S-0043



SUMMARY OF ESTIMATED SPILLWAY QUANTITIES

	ITEM	DESCRIPTION	UNIT	AMOUNT	REMARKS
NORMAL	1.0	EXCAVATION			
	1.1	EARTH	C.Y.	80,000	INTERPOLATED FROM AVAILABLE BORING DATA.
	1.2	ROCK	C.Y.	31,300	
	2.0	BACKFILL			
	2.1	RANDOM	C.Y.	2,000	REFERENCE SPECIFICATION C-2.1-P1
	2.2	IMPERVIOUS	C.Y.	200	
	2.3	RIPRAP BEDDING	C.Y.	1,200	
	2.4	RIPRAP	C.Y.	1,400	
	2.5	C1 FILTER MATERIAL	C.Y.	1,000	
	2.6	C2 FILTER MATERIAL	C.Y.	2,200	
	3.0	PIPES			
	3.1	10" ϕ PERFORATED C.M.P.	L.F.	300	
	3.2	8" ϕ NONPERF. C.M.P.	L.F.	225	
	3.3	8" ϕ PERFORATED C.M.P.	L.F.	425	
	3.4	6" ϕ PERFORATED C.M.P.	L.F.	825	
	3.5	6" ϕ PERF. CONC. PIPE	L.F.	1,300	
	4.0	CONCRETE			
	4.1	4000 PSI	C.Y.	6,600	
	4.2	2500 PSI	C.Y.	130	
	5.0	REBAR			
	5.1	# 11	TONS	30.0	
	5.2	# 11 (ANCHORS)	TONS	30.0	BASED ON 25' ROCK ANCHORS
	5.3	# 9	TONS	45.9	
	5.4	# 8	TONS	73.6	
	5.5	# 7	TONS	105.0	
	5.6	# 6	TONS	38.3	
	5.7	# 5	TONS	17.0	
	5.8	# 4	TONS	2.1	
	5.9	# 10	TONS	9.6	
	6.0	WATER STOP	L.F.	2200	6"
			L.F.	300	9"
EMERGENCY	1.0	EXCAVATION			
	1.1	EARTH	C.Y.	257,700	INTERPOLATED FROM AVAILABLE BORING DATA
	1.2	ROCK	C.Y.	30,500	
	2.0	FILL			
	2.1	RIPRAP BEDDING	C.Y.	1,000	
	2.2	RIPRAP	C.Y.	2,400	

ALL QUANTITIES ARE ESTIMATED - NET BY FIELD
EXCAVATION & FILL QUANTIES ARE IN-PLACE COMPACTED VOLUMES.

REFERENCE SPECIFICATIONS

- C-1.4-P3 - EXCAVATION AND BACKFILL OF THE MAYO CREEK DAM NORMAL SPILLWAY
- C-2.1-P1 - EARTHWORK FOR CONSTRUCTION OF MAYO CREEK DAM
- C-4.2-P1 REINFORCING STEEL
- C-4.4-P1 - MISCELLANEOUS STEEL
- C-5.2-P1 - CONCRETE CONSTRUCTION

REFERENCE DRAWINGS

- S-0031 - MAYO CREEK DAM - EMERGEN GRADING DETAILS.
- S-0032 - MAYO CREEK DAM - NORM GRADING DETAILS.
- S-0033 - MAYO CREEK DAM - NC PLAN & PROFILE
- S-0035 - MAYO CREEK DAM - N. SECTIONS & DETAILS
- S-0037 - MAYO CREEK DAM - NORMAL SPILLWAY WALL ELEVATIONS & DETAILS.

NOTES:

1. FOR GENERAL NOTES SEE DWG. S-0009
2. FOR NORMAL SPILLWAY GRADING DETAILS & HORIZONTAL CONTROL SEE DWG. S-0032
3. FOR EMERGENCY SPILLWAY GRADING DETAILS SEE DWG. S-0031.
4. SPILLWAY CLEARING & GRUBBING SHALL CONFORM TO NOTES 2 & 3 DWG. S-0002. AREA BETWEEN EMERGENCY SPILLWAY & SADDLE DAM MUST NOT BE DISTURBED.

EXHIBIT 5

AS-BUILT
CONSTRUCTION
BID
CLIENT'S REVIEW

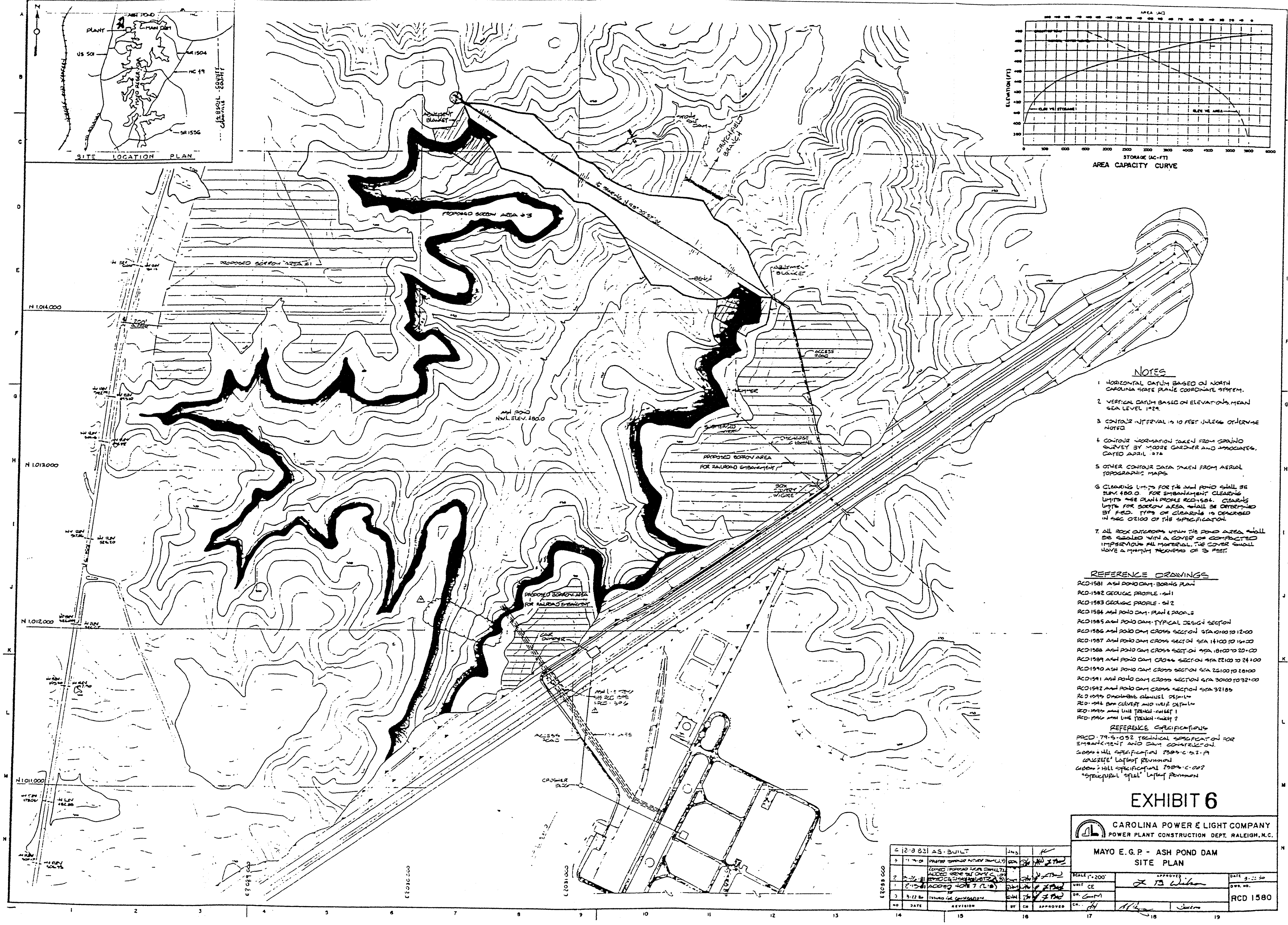
CAROLINA POWER & LIGHT COMPANY
MAYO ELECTRIC GENERATING PLANT
1983-88-1,500,000 KW INSTALLATION
UNITS 1 & 2

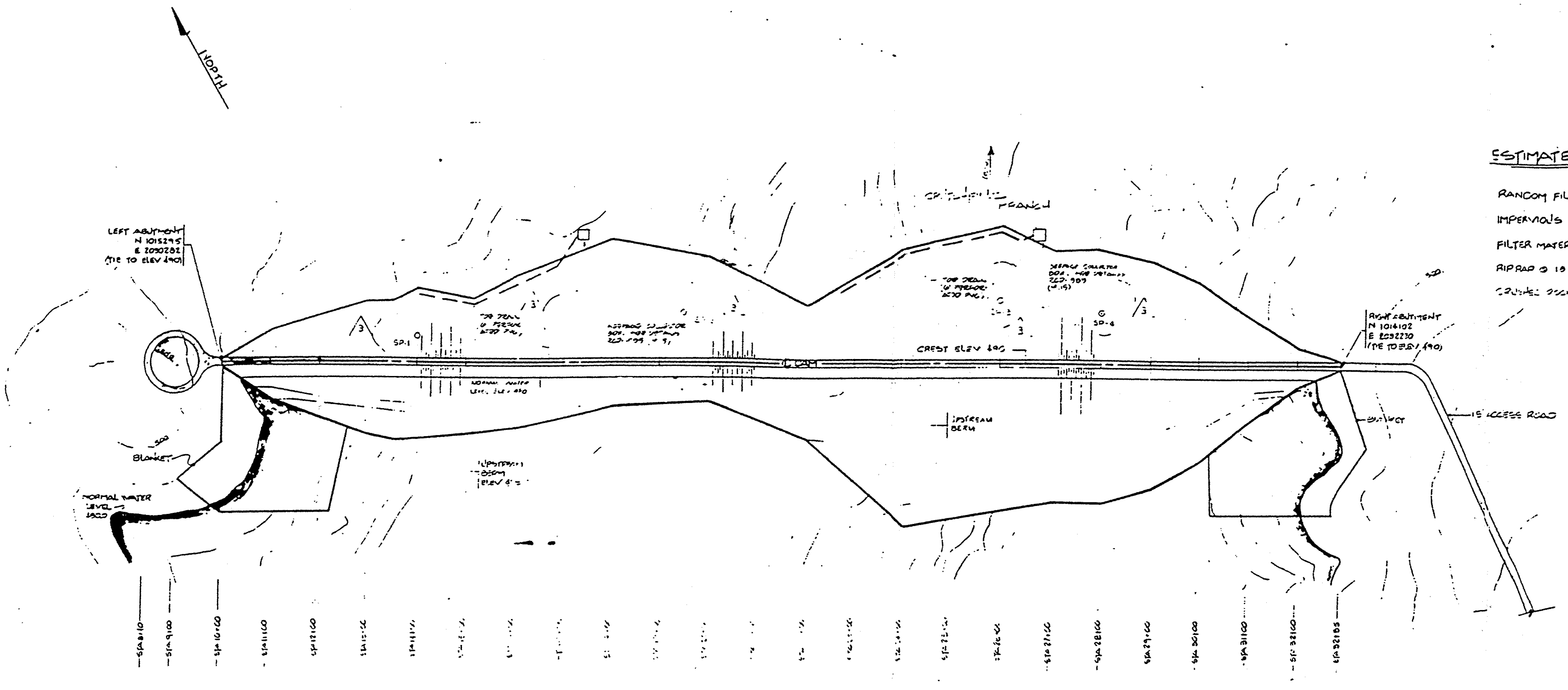
MAYO CREEK DAM
PLAN OF SPILLWAYS

Gibbs & Hill, Inc.

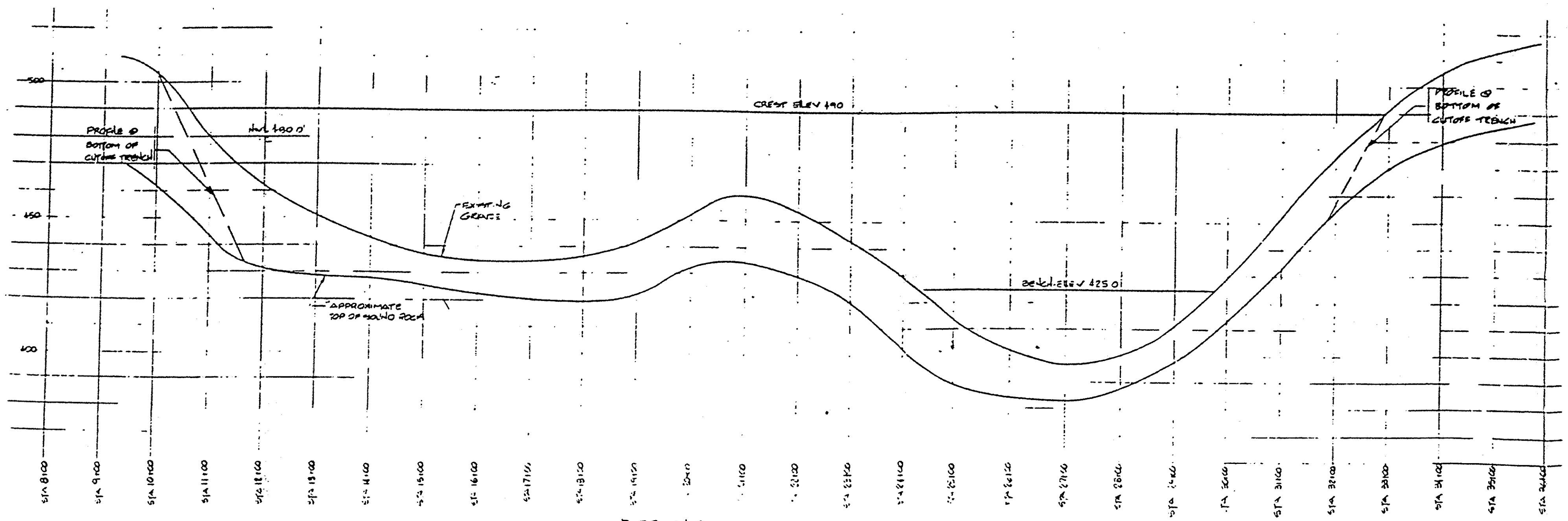
SCALE 1" = 100'

S-0030


SITE LOCATION PLAN
ASH POND
MAIN DAM
PLANT
US 501
SR 1504
NC 49
SR 1556
AREA CAPACITY CURVE
AREA (AC)
ELEVATION (FT)
STORAGE (AC-FT)
ELEV VS STORAGE
ELEV VS AREA
PROPOSED BORROW AREA #3
PROPOSED BORROW AREA #1
ABUTMENT BLANKET
CRUTCHFIELD BRANCH
ASH POND NWL ELEV. 480.0
PROPOSED BORROW AREA FOR RAILROAD EMBANKMENT
BOX CULVERT WEIR
ACCESS ROAD
CAR DUMPER
CRUSHER
N 1,014,000
N 1,013,000
N 1,012,000
N 1,011,000
NOTES
1 HORIZONTAL DATUM BASED ON NORTH CAROLINA STATE PLANE COORDINATE SYSTEM.
2 VERTICAL DATUM BASED ON ELEVATIONS MEAN SEA LEVEL 1929.
3 CONTOUR INTERVAL IS 10 FEET UNLESS OTHERWISE NOTED
4 CONTOUR INFORMATION TAKEN FROM GROUND SURVEY BY MOORE GARDNER AND ASSOCIATES. DATED APRIL 1974
5 OTHER CONTOUR DATA TAKEN FROM AERIAL TOPOGRAPHIC MAPS
6 CLEARING LIMITS FOR THE ASH POND SHALL BE ELEV. 480.0. FOR EMBANKMENT CLEARING LIMITS SEE PLAN & PROFILE RCD-1584. CLEARING LIMITS FOR BORROW AREA SHALL BE DETERMINED BY FIELD. TYPE OF CLEARING IS DESCRIBED IN SEC 02100 OF THE SPECIFICATION.
7. ALL ROCK OUTCROPS WITHIN THE POND AREA SHALL BE SEALED WITH A COVER OF COMPACTED IMPERVIOUS FILL MATERIAL. THE COVER SHALL HAVE A MINIMUM THICKNESS OF 3 FEET.
REFERENCE DRAWINGS
RCD-1581 ASH POND DAM - BORING PLAN
RCD-1582 GEOLOGIC PROFILE - SH 1
RCD-1583 GEOLOGIC PROFILE - SH 2
RCD-1584 ASH POND DAM - PLAN & PROFILE
RCD-1585 ASH POND DAM - TYPICAL DESIGN SECTION
RCD-1586 ASH POND DAM CROSS SECTION STA 10+00 TO 12+00
RCD-1587 ASH POND DAM CROSS SECTION STA 14+00 TO 16+00
RCD-1588 ASH POND DAM CROSS SECTION STA 18+00 TO 20+00
RCD-1589 ASH POND DAM CROSS SECTION STA 22+00 TO 24+00
RCD-1590 ASH POND DAM CROSS SECTION STA 26+00 TO 28+00
RCD-1591 ASH POND DAM CROSS SECTION STA 30+00 TO 32+00
RCD-1592 ASH POND DAM CROSS SECTION STA 32+85
RCD-1595 DISCHARGE CHANNEL DETAILS
RCD-1594 BOX CULVERT AND WEIR DETAILS
RCD-1595 ASH LINE TRENCH - SHEET 1
RCD-1596 ASH LINE TRENCH - SHEET 2
REFERENCE SPECIFICATIONS
PRCD-79-S-052 TECHNICAL SPECIFICATION FOR EMBANKMENT AND DAM CONSTRUCTION.
GIBBS & HILL SPECIFICATION 2383-C-S2-A "CONCRETE" LATEST REVISION
GIBBS & HILL SPECIFICATION 2383-C-002 "STRUCTURAL STEEL" LATEST REVISION
EXHIBIT 6
CAROLINA POWER & LIGHT COMPANY
POWER PLANT CONSTRUCTION DEPT. RALEIGH, N.C.
MAYO E.G.P. - ASH POND DAM
SITE PLAN
4 12-8-83 AS-BUILT
1 ADDED NOTE 7
0 ISSUED FOR CONSTRUCTION
NO DATE REVISION BY CH APPROVED
SCALE 1"=200'
UNIT CE
APPROVED
DATE
DWG. NO.
RCD 1580



PLAN VIEW OF ASH POND DAM
SCALE 1" = 100'-0"



℄ PROFILE OF ASH POND DAM
SCALES
HORIZONTAL 1" = 100'-0"
VERTICAL 1" = 20'-0"

ESTIMATED QUANTITIES (NET BY FIELD)

RANDOM FILL	[illegible] CU YD
IMPERVIOUS MATERIAL	[illegible] CU YD
FILTER MATERIAL	[illegible] CU YD
RIPRAP @ 18 DEEP	[illegible] SQ YD
CRUSHED ROCK BEDDING (6.0" DEEP)	[illegible] SQ YD

PIEZOMETER INSTALLATION SCHEDULE

No.	℄ STA	HORIZ. OFFSET	ELEV
SP-1	14+00	90'	477.[illegible]
SP-2	17+50	100'	[illegible]
SP-3	20+00	125'	[illegible]
SP-4	28+00	100'	455.32

TYPICAL INSTALLATION SHALL BE AS SHOWN ON RCD 1584 (D-13)

NOTES

1. CONTOUR INTERVAL IS 10 FEET.
2. EXCAVATION FOR FOUNDATION SHALL BE IN ACCORDANCE WITH SPECIFICATION PPCD-79-S-052
3. TOP OF WEATHERED ROCK AND SOUND ROCK IS APPROXIMATE AND SHALL BE DETERMINED IN THE FIELD
4. EMBANKMENT MATERIAL SHALL BE PLACED AND COMPACTED IN ACCORDANCE WITH SPECIFICATION PPCD-79-S-052
5. QUANTITIES SHOWN ON THIS DRAWING ARE ESTIMATED. ACTUAL NET QUANTITIES SHALL BE DETERMINED IN THE FIELD.

FOR COMPLETE LIST OF REFERENCE DRAWINGS, SEE RCD-1560

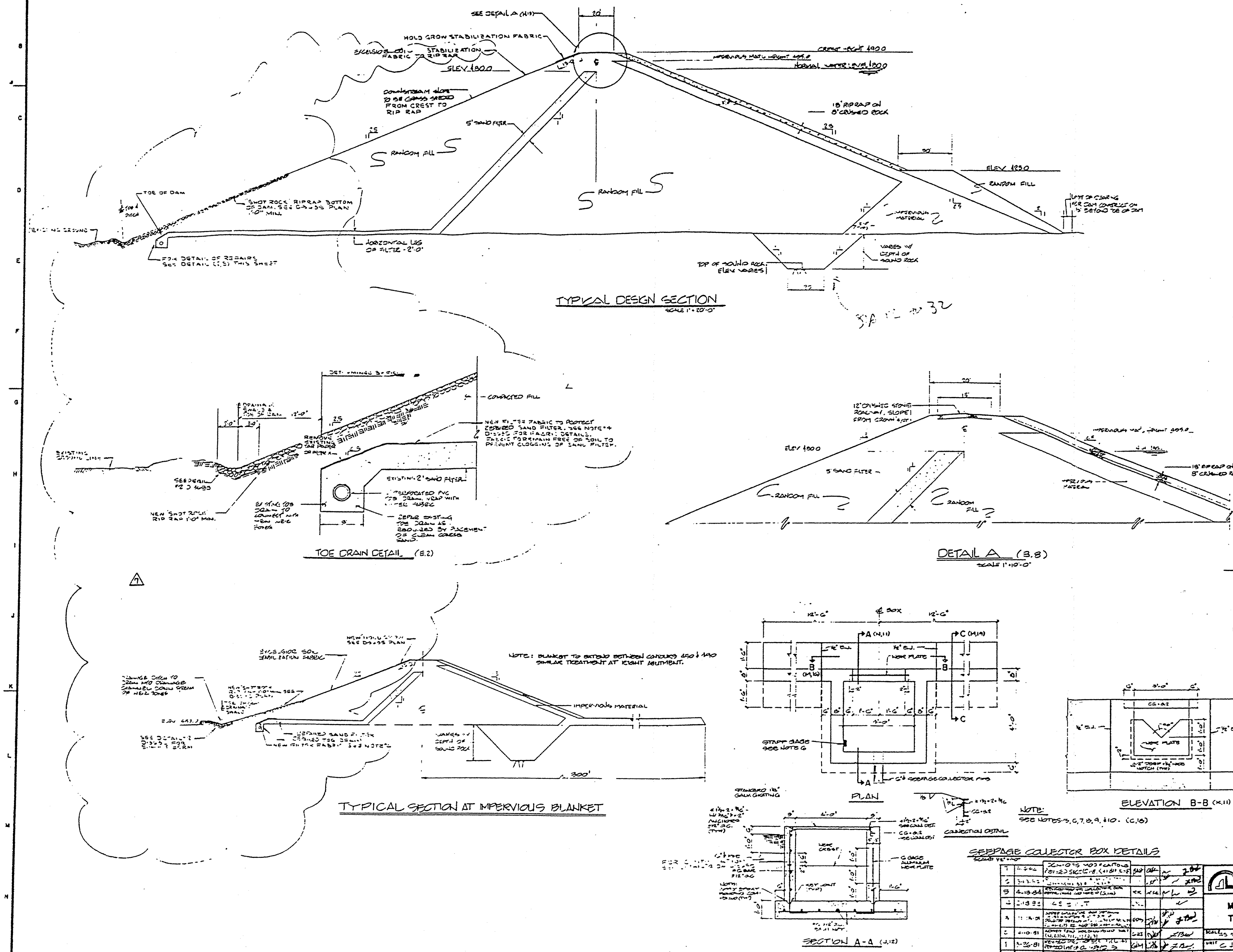
EXHIBIT 7

CAROLINA POWER & LIGHT COMPANY
POWER PLANT CONSTRUCTION DEPT. RALEIGH, N.C.

MAYO E. G. P. ASH POND DAM
PLAN & PROFILE

NO	DATE	REVISION	BY	CH	APPROVED
3	5-2-83	[illegible]	[illegible]	[illegible]	[illegible]
2	[illegible]	[illegible]	[illegible]		[illegible]
1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0	9-22-81	ISSUED FOR CONSTRUCTION	[illegible]		[illegible]

SCALE: SHOWN
UNIT: CE
DR.: [illegible]
CH.: [illegible]
APPROVED: L. B. Wilson
DWG. NO. RCD-1584



NOTES

1. [illegible] WEIR PLATE IN NOTCH W/ ELASTOMERIC SEALANT [illegible] OR EQUAL AS MANUFACTURED BY [illegible] PRODUCTS.
2. STAFF GAGE SHALL BE A [illegible] STAFF GAGE [illegible] GRADUATED 0-1.50 FT., AS SUPPLIED BY [illegible] OR APPROVED EQUAL. PLASTIC OR SIMILAR TYPE OF MATERIAL IS NOT ACCEPTABLE FOR THIS [illegible]. ZERO POINT OF STAFF GAGE SHALL BE SET AT SAME ELEVATION AS INVERT OF WEIR NOTCH.
3. CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI @ 28 DAYS.
4. ALL REINFORCING STEEL SHALL BE ASTM A615, GRADE 60. BARS SHALL BE IN PLACE PRIOR TO PLACING CONCRETE.
5. CONCRETE WORK SHALL CONFORM TO [illegible] BUILDING CODE REQUIREMENTS FOR CONCRETE, ACI 318-77.
6. ALL STEEL AND GRATING FOR COLLECTION BOX TO BE GALVANIZED.

LIST OF DRAWINGS

- SEE RCD-1580 FOR LIST
- SEE ALSO D-3686 FOR DRAINAGE IMPROVEMENTS.

SPECIFICATION

FE1LD-54-S-[illegible] ASH POND DAM REPAIRS
PPCL - 79-S-[illegible] ASH POND DAM SPECIFICATIONS

NOTE: SEE NOTES 3, 6, 7, 8, 9, & 10. (C,18)

SEEPAGE COLLECTOR BOX DETAILS

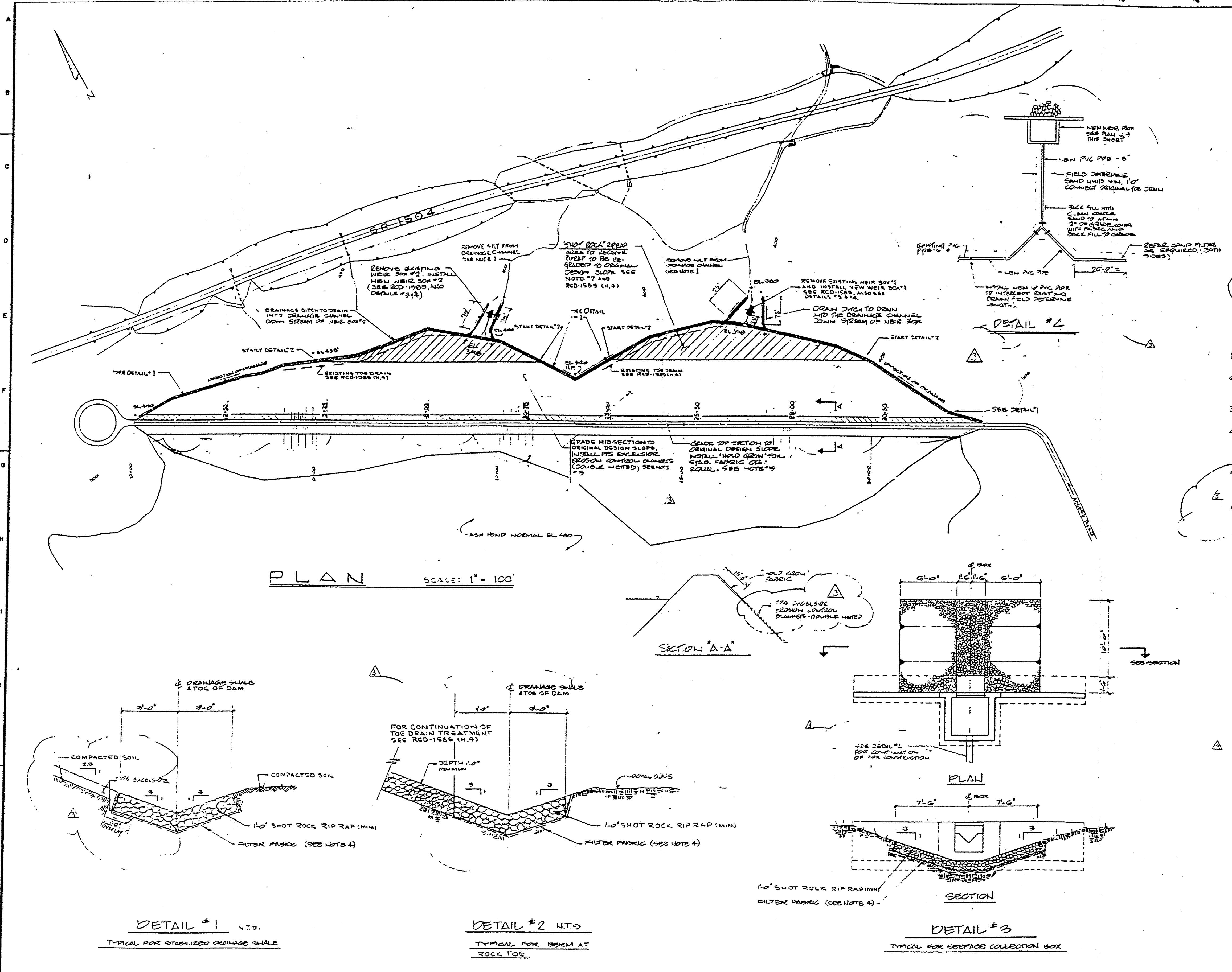
EXHIBIT 8

NO.	DATE	REVISION	BY	CH	APPROVED
7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6	[illegible]	[illegible]		[illegible]	[illegible]
5	4-13-84	[illegible] (J,19)	[illegible]	[illegible]	[illegible]
4	[illegible]	AS BUILT	[illegible]		[illegible]
3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	4-10-81	[illegible]	[illegible]	[illegible]	[illegible]
1	3-26-81	[illegible]	GM	[illegible]	[illegible]
0	8-12-80	ISSUED FOR CONSTRUCTION	[illegible]	[illegible]	[illegible]

CAROLINA POWER & LIGHT COMPANY
POWER PLANT CONSTRUCTION DEPT. RALEIGH, N.C.

MAYO E. G. P. - ASH POND DAM
TYPICAL DESIGN SECTION

SCALE AS SHOWN
APPROVED [illegible]
DATE [illegible]
UNIT [illegible]
DR. [illegible]
CH. [illegible]
DWG. NO. RCD-1585



LEGEND

"SHOTROCK" RIPRAP

'HOLD GROW' SOIL STAB FABRIC

PPS EXCELSIOR DOUBLE NETTED

ESTIMATED QUANTITIES

"SHOT ROCK" RIPRAP	4,000 TONS
BEDDING STONE/FILTER FABRIC	2000 TONS 17,000 YD²
6" PVC PIPE	75 LF
6" PVC SLOTTED PIPE	10 LF
FILTER FABRIC	1200 YD²
#57 STONE	70 TONS
HOLD GROW	21,000 YD²
PPS EXCELSIOR	31,500 YD²
RIPRAP FOR DITCHES INCLUDING BEDDING	1780 YD²

NOTES

1. REMOVE SILT FROM DRAINAGE CHANNELS AS SHOWN FROM TOE OF DAM TO S.R. 1504.
2. REMOVE EXISTING SEEPAGE COLLECTOR BOXES AND CONSTRUCT NEW SEEPAGE COLLECTOR BOXES AS SHOWN ON DWG. RCD 1585. SEE SPECIFICATION SECTION 03300
3. REFER TO SPECIFICATION FE&CD-84-5-385 FOR GRADING AND SEEDING REQUIREMENTS.
4. FILTER FABRIC SHALL BE TREVIRA TYPE 1127 OR EQUAL. PROVIDE 6" MIN CRUSHED STONE FOR RIP RAP BEDDING OVER FILTER MATERIAL. MAXIMUM ALLOWABLE HEIGHT FOR DROPPING RIP RAP ON FILTER BEDDING SHALL BE 3'. LAP FABRIC 1' MIN. AT EDGES.
5. 'HOLD GROW' & 'EXCELSIOR' SOIL STABILIZATION FABRICS WILL BE INSTALLED AFTER SOIL PREPARATION & SEEDING HAVE BEEN COMPLETED. SEE SPECIFICATION SECTION 02486 FOR INSTALLATION PROCEDURES.
6. THE EXISTING SAND FILTER WILL BE REPAIRED AS SHOWN ON RCD-1585. THE SLOPE WILL BE REGRADED TO EXISTING DESIGN ELEVATIONS AND RIPRAP WILL BE PLACED ON THE BOTTOM THIRD OF THE DAM.

REFERENCE DRAWINGS

RCD-1584 ASH POND DAM - PLAN & PROFILE

RCD-1585 ASH POND DAM - TYPICAL DESIGN SECTION (WEIR BOX DETAILS)

REFERENCE SPECIFICATIONS

FE&CD-84-5-385 ASH POND DAM REPAIRS

EXHIBIT 9

NO.	DATE	REVISION	BY	CH	APPROVED
3	9-5-84	[illegible] MODIFICATIONS ... CHANGE ... TO PPS EXCELSIOR ...			
2	8-10-84	ADDED ... CHANGE ...			
1	7-6-84	MODIF. ... ADDED ...			
0	4-13-84	ISSUED FOR CONSTRUCTION			

CAROLINA POWER & LIGHT COMPANY
FOSSIL PLANT ENGINEERING & CONSTRUCTION DEPT.

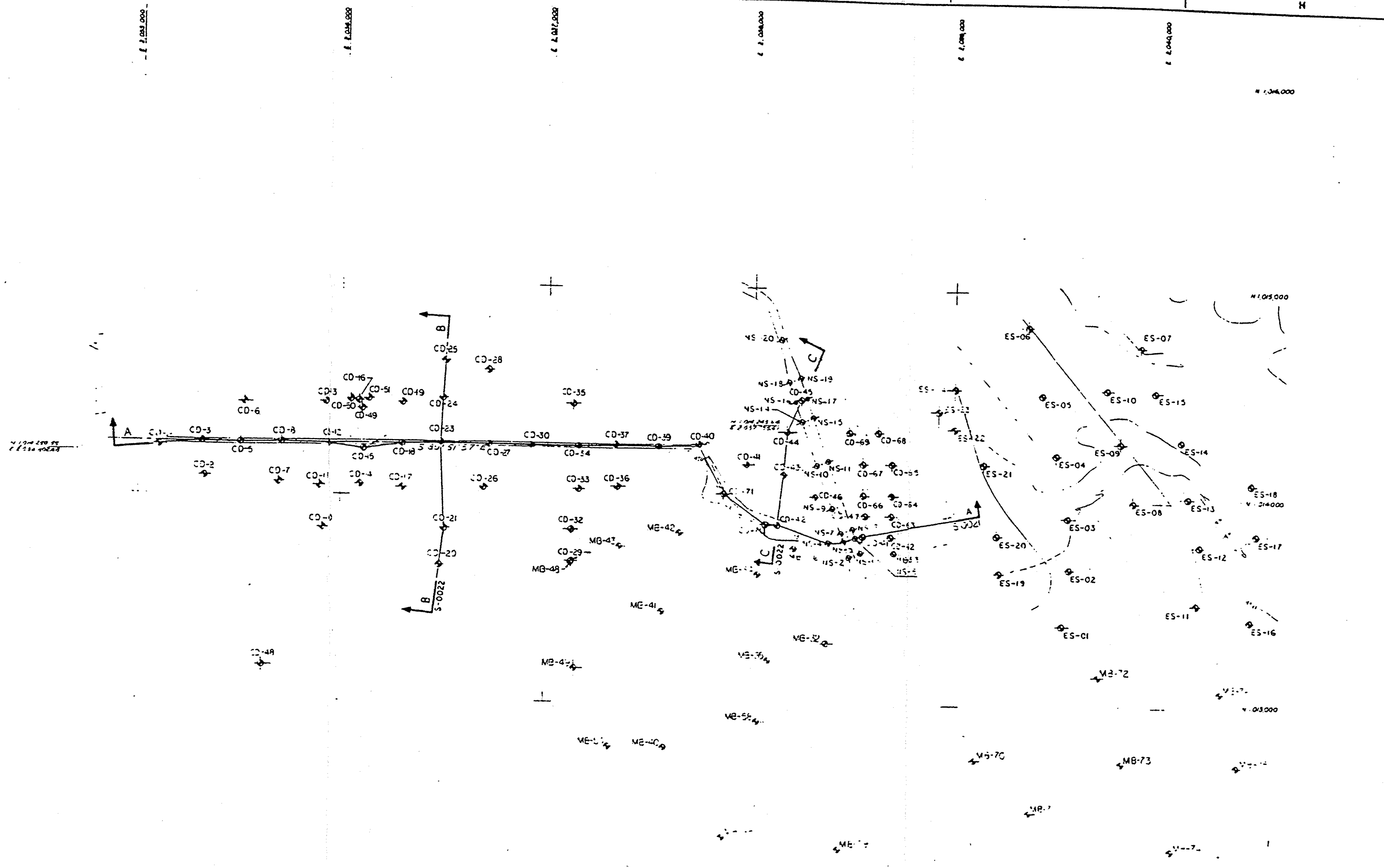
MAYO ELECTRIC GENERATING PLANT
ASH POND DAM
DRAINAGE IMPROVEMENTS AND SEEDING PLAN

SCALE: AS NOTED
UNIT/SECTION: CIV/ED
DATE: 4-13-84
DWG. NO. D-3685

TABLE
SUMMARY OF INFORMATION
MATERIALS FROM PLANT GRADING
MAYO ELECTRIC GENERATING PLANT
CAROLINA POWER & LIGHT COMPANY
PERSON COUNTY, NORTH CAROLINA
OUR PROJECT NO. RA-802

TYPE	GENERAL DESCRIPTION	RECOMMENDED USES	ESTIMATED AMOUNT, CUBIC YARDS *	OTHER INFORMATION
RESIDUAL SOIL	Stiff to hard tan to brown fine sandy Silt with some micaceous areas Thickness is erratic - ranges from 1 foot to 30 feet, averages about 5 feet.	Plant structural fill	1,600,000	Excavatable with conventional equipment. No compaction tests have been performed on this material. Some of most micaceous soil may need to be restricted to yard fills.
DECOMPOSED ROCK	Saprolites of parent rocks - generally very dense silty sand texture. Thickness ranges from 2 to 17 feet with an average of about 8 feet.	Plant structural fill, Dam Shells	1,400,000	Probably will require heavy equipment or some ripping to excavate. No compaction tests have been performed. Use of schistose zones restricted to yard fills.
GREENSTONE	Soft to moderately hard rock; includes green (brown weathering) schists and phyllites of green mica (chlorite) and green biotite. Well developed cleavage planes. Weathering is deepest of all rock types. Often found as thin weathered zone sandwiched between harder rocks.	Plant yard fills or waste	450,000	Most will require very hard ripping or light blasting to excavate. Decomposes rapidly upon wetting and drying. Compaction will produce much breakdown.
QUARTZO-FELDSPATHIC PHYLLITE	Relatively slaty moderately hard to hard rock with few joints.	Dam shells	320,000	Will require blasting to excavate. Probably will break into slabby pieces. Little compaction breakdown.
METATUFF	Moderately hard to hard rock with closely spaced joints and phyllitic cleavage.	Dam shells	1,025,000	Will require blasting to excavate. Pieces may be suitable for rip rap but are likely to be too slabby. Moderate to high compaction breakdown.
GRANITIC GNEISS	Moderately hard to hard rock. Similar in appearance to metatuff but with more widely spaced joints and cleavages. Includes some biotite and mica gneiss.	Dam shells, Rip rap, Filter source	1,640,000 *Based on 6,435,000 cubic yards total excavation; unadjusted for topsoil or shrinkage.	Suitable for crushing into filter sizes in some areas. Will require blasting to excavate. Moderate to low compaction breakdown.

EXHIBIT 10



REFERENCE DRAWINGS

S-0005 INDEX OF BORINGS & TEST PITS
S-0009 MAYO CREEK DAM - PLAN & PROFILE
S-0021 MAYO CREEK DAM - GENERALIZED GEOLOGIC CROSS SECTION A-A
S-0022 MAYO CREEK DAM - GENERALIZED GEOLOGIC CROSS SECTIONS B-B & C-C

GENERAL NOTES

1. HORIZONTAL DATUM BASED ON NORTH CAROLINA STATE PLANE CO-ORDINATE SYSTEM
2. VERTICAL DATUM BASED ON SEA LEVEL DATUM 1929
3. CONTOUR INTERVAL 10 FEET UNLESS NOTED
4. CONTOUR DATA 200 FT NORTH & SOUTH OF MAIN DAM BASE LINE FROM SURVEY STATION 7+42.3 TO 16+50 & 30+00 TO 36+95.57 TAKEN FROM GROUND SURVEYS BY MOORE GARDNER & ASSOCIATES DATED APRIL 1974
5. ALL OTHER CONTOUR DATA SHOWN WITH SOLID LINES TAKEN FROM TOPOGRAPHIC MAPS BY AERO SERVICE CORP DATED JANUARY 1961
6. CONTOUR DATA SHOWN DASHED IS APPROXIMATE
7. FOR LIST OF REFERENCE DWGS & SPECIFICATIONS SEE DWG S-0009

EXHIBIT 11

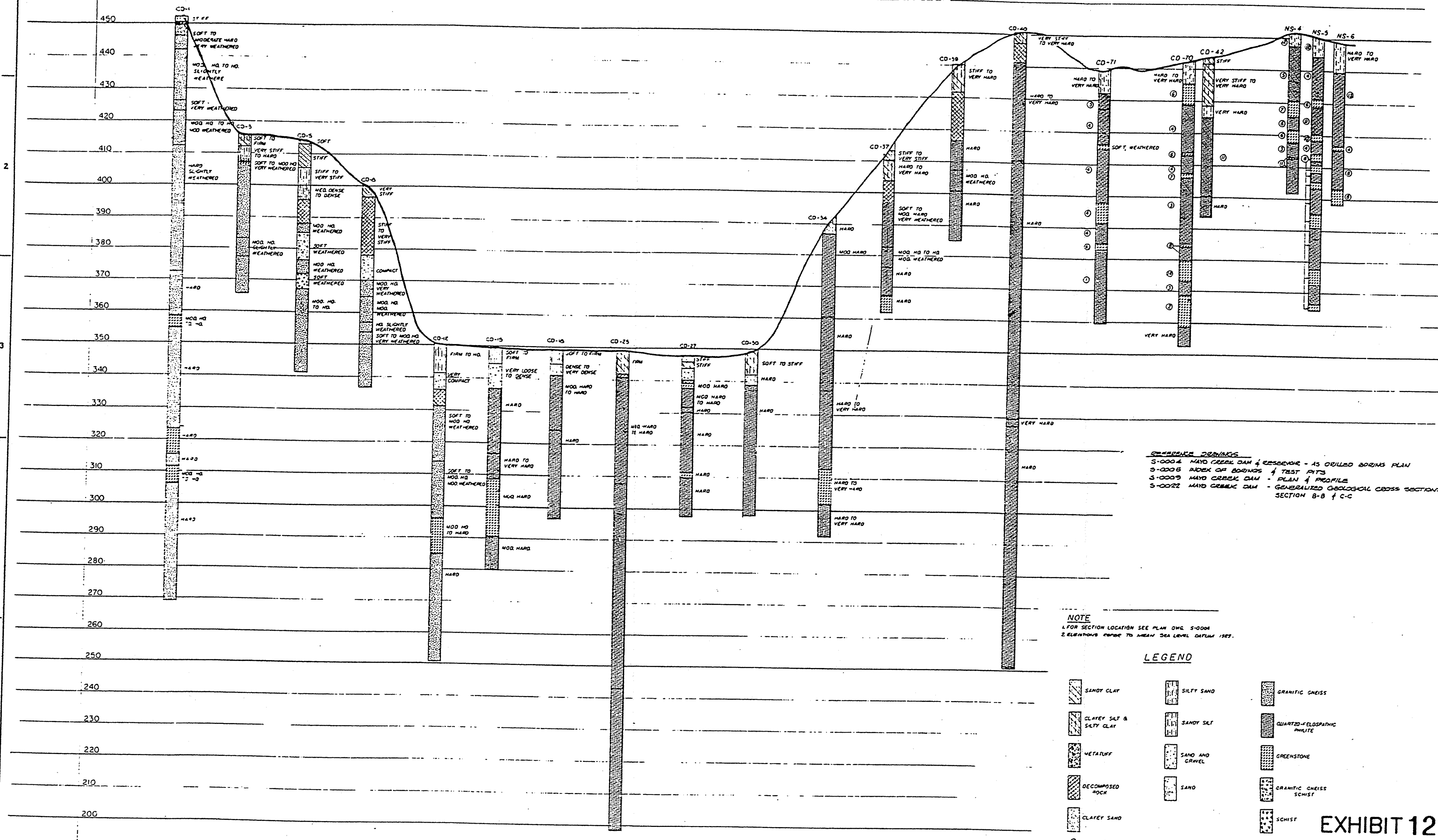
CAROLINA POWER & LIGHT COMPANY
MAYO ELECTRIC GENERATING PLANT
1963-65 - 1,500,000 KW INSTALLATION
UNITS 1 & 2

MAYO CREEK DAM & RESERVOIR
AS DRILLED BORING PLAN

Gibbs & Hill, Inc.

SCALE 1" = 200'

S-0004



SECTION A-A

HORIZONTAL SCALE 0 100 200 300FEET

VERTICAL SCALE 0 10 20 30FEET

REFERENCE DRAWINGS

S-0004 MAYO CREEK DAM & RESERVOIR - AS DRILLED BORING PLAN
S-0005 INDEX OF BORINGS & TEST PITS
S-0009 MAYO CREEK DAM - PLAN & PROFILE
S-0022 MAYO CREEK DAM - GENERALIZED GEOLOGICAL CROSS SECTIONS SECTION B-B & C-C

NOTE

1. FOR SECTION LOCATION SEE PLAN DWG. S-0004
2. ELEVATIONS REFER TO MEAN SEA LEVEL DATUM 1929.

LEGEND

SANDY CLAY
SILTY SAND
GRANITIC GNEISS
CLAYEY SILT & SILTY CLAY
SANDY SILT
QUARTZO-FELDSPATHIC PHYLITE
METATUFF
SAND AND GRAVEL
GREENSTONE
DECOMPOSED ROCK
SAND
GRANITIC GNEISS SCHIST
CLAYEY SAND
SCHIST

① HARD TO VERY HARD, SLIGHTLY WEATHERED
② VERY HARD, SLIGHTLY WEATHERED
③ HARD TO MODERATELY HARD, MODERATELY WEATHERED
④ MODERATELY HARD TO SOFT, SEVERELY WEATHERED
⑤ SOFT TO VERY SOFT, SEVERELY WEATHERED
⑥ SOFT, SEVERELY WEATHERED
⑦ VERY SOFT, SEVERELY WEATHERED
⑧ HARD, SLIGHTLY WEATHERED
⑨ HARD TO MODERATELY HARD, SEVERELY TO SLIGHTLY WEATHERED.
⑩ MODERATELY HARD, SEVERLY WEATHERED
⑪ MODERATELY HARD, MODERATELY WEATHERED
⑫ VERY HARD
⑬ HARD TO MODERATELY HARD, MODERATELY TO SEVERELY WEATHERED.
⑭ VERY HARD, FRESHLY WEATHERED

EXHIBIT 12

CAROLINA POWER & LIGHT COMPANY
MAYO ELECTRIC GENERATING PLANT
1983-86-1,500,000 KW INSTALLATION
UNITS 1 & 2

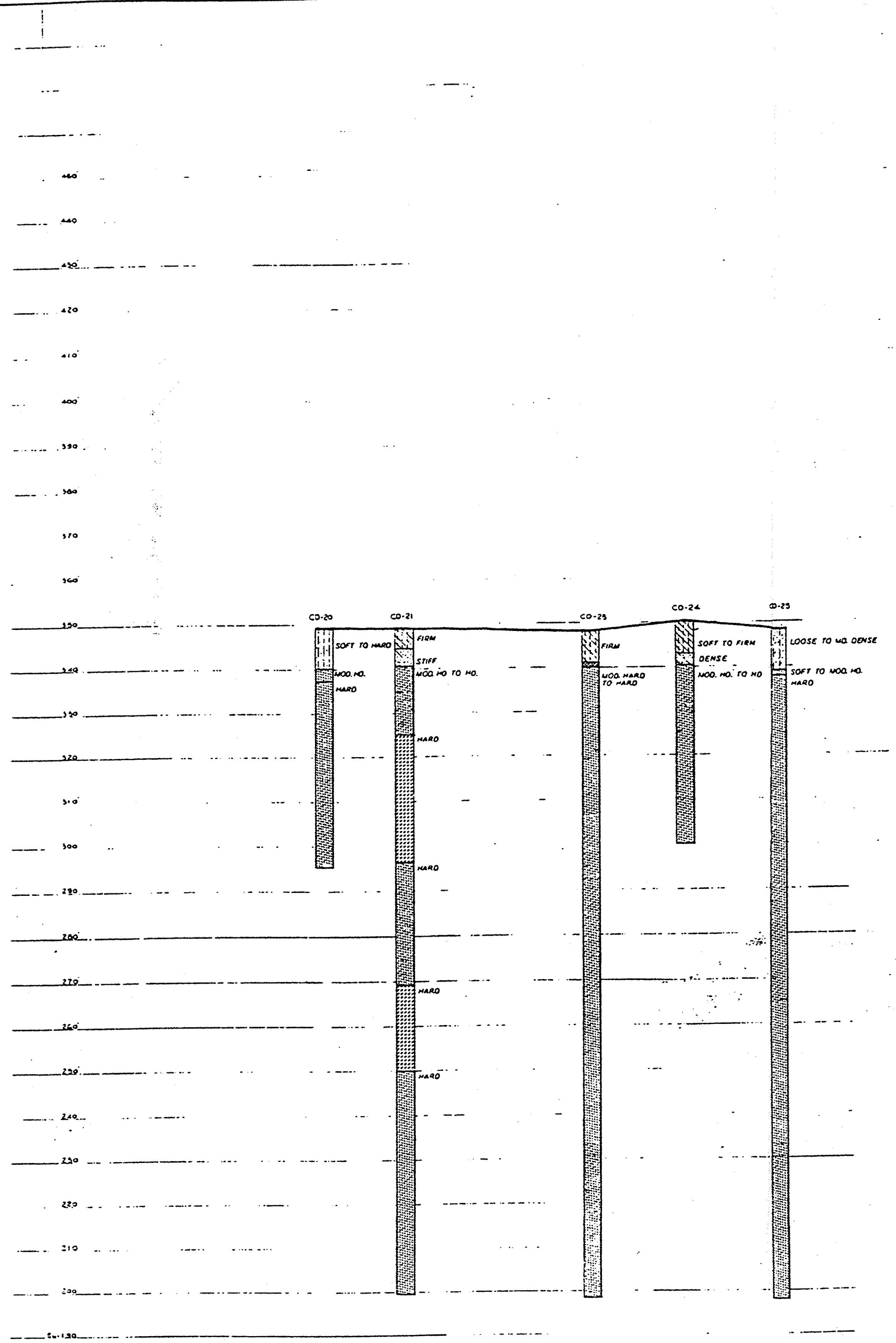
MAYO CREEK DAM
GENERALIZED GEOLOGIC CROSS SECTION
SECTION A-A

Gibbs & Hill, Inc.

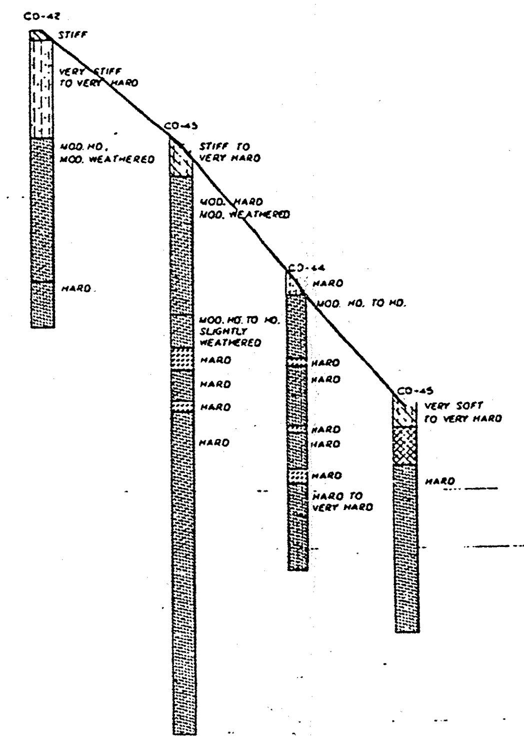
SCALE: AS SHOWN

S-0021

INFORMATION



SECTION B-B



SECTION C-C

REFERENCE DRAWINGS

S-0004 MAYO CREEK DAM & RESERVOIR - AS DRILLED BORING PLAN
S-0005 INDEX OF BORINGS & TEST PITS
S-0009 MAYO CREEK DAM - PLAN & PROFILE
S-0021 MAYO CREEK DAM - GENERALIZED GEOLOGICAL CROSS SECTION - SECTION A-A

NOTES

1. FOR SECTION LOCATION SEE PLAN DWG. S-0004
2. FOR LEGEND SEE DWG S-0021
3. ELEVATIONS REFER TO MEAN SEA LEVEL DATUM 1929.

HORIZONTAL SCALE
0 100 200 300 FEET

VERTICAL SCALE
0 10 20 30 FEET

EXHIBIT 13

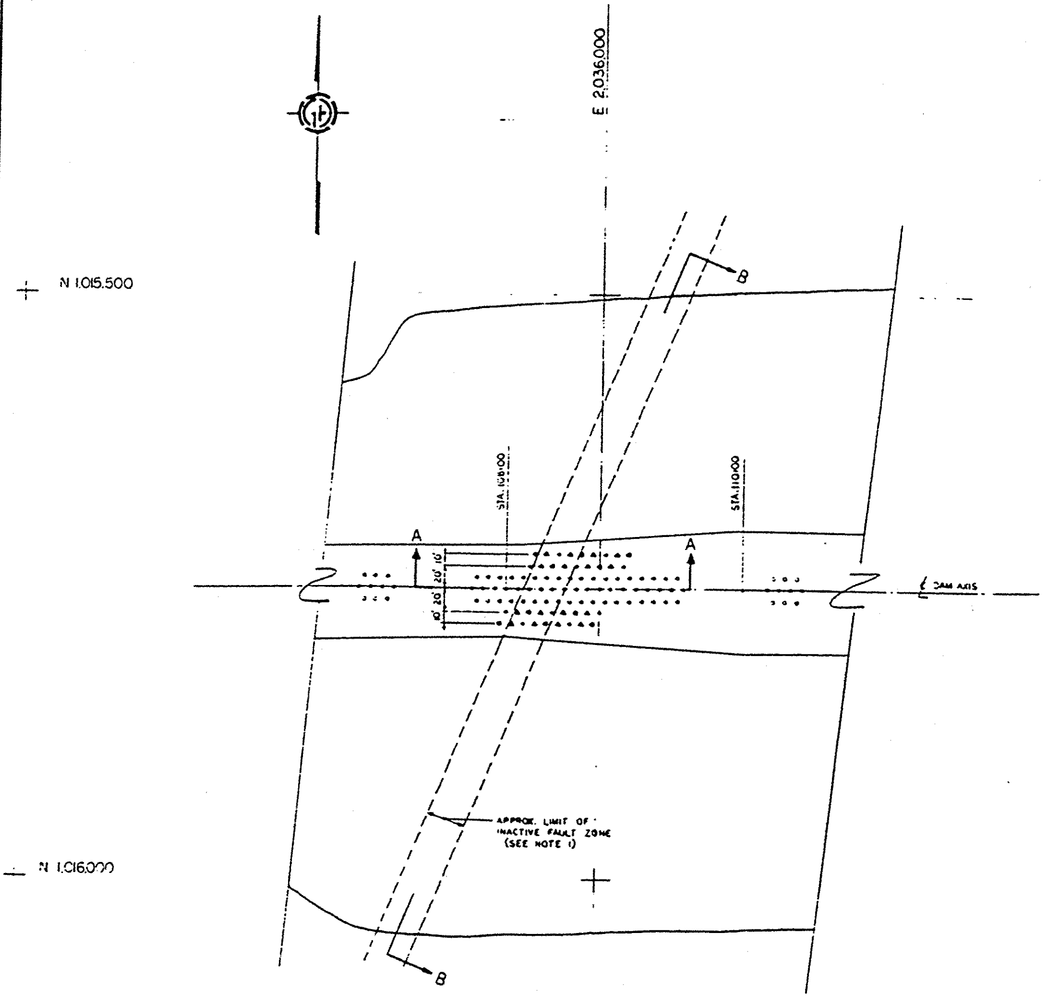
CAROLINA POWER & LIGHT COMPANY
MAYO ELECTRIC GENERATING PLANT
1983-85-1,500,000 KW INSTALLATION
UNITS 1 & 2

MAYO CREEK DAM
GENERALIZED GEOLOGIC CROSS SECTIONS
SECTION B-B & C-C

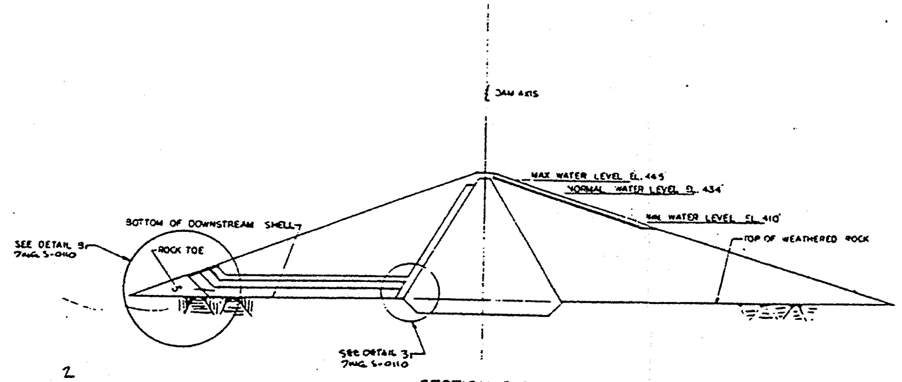
Gibbs & Hill, Inc.

SCALE AS SHOWN

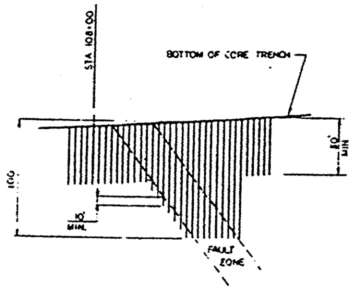
S-0022



PLAN LOCATION OF INACTIVE FAULT ZONE AND ARRANGEMENT OF GROUTING HOLES IN THE VICINITY OF THE SAME AREA



SECTION B-B



SECTION A-A

DEPTH OF GROUTING HOLES IN INACTIVE FAULT ZONE

GENERAL NOTES:

1.- LIMITS OF INACTIVE FAULT ZONE ARE APPROXIMATE AND SHALL BE DETERMINED BY THE OWNER DURING FOUNDATION PREPARATION. LIMIT OF FAULT AND NUMBER OF DEEP GROUT HOLES MAY CHANGE ACCORDINGLY.

2.- THERE MAY BE OTHER FAULT ZONES IN THE FLOOD PLAIN. WHEN UNCOVERED SAME TREATMENT SHALL BE APPLIED.

3.- FOR EXCAVATION AND TREATMENT OF FOUNDATION IN INACTIVE FAULT ZONE SEE SPEC. 2383-C-2.1-M - SECTIONS - 3.5.3, 3.5.4 & 3.5.5.

4.- FOR LIST OF REFERENCE DRAWINGS, QUANTITIES & ADDITIONAL INFORMATION SEE DWG. S-0016

5.- FOR LEGEND OF GROUT HOLES SEE DWG. S-0016

6. ALL CRACKS AND FISSURES ENCOUNTERED ON THE SURFACE AT THE FAULT ZONE SHALL BE FILLED WITH DENTAL CONCRETE.

EXHIBIT 14

5		DG	AS-BUILT
1		JP	ADDED DIMENSION IN SECT. 3
0		JT	CONSTRUCTION
B		JT	BIDS
A		JT	CLIENT'S REVIEW

CAROLINA POWER & LIGHT COMPANY
MAYO ELECTRIC GENERATING PLANT
1983-86-1,500,000 KW INSTALLATION
UNITS 1 & 2

MAYO CREEK DAM
TREATMENT OF FOUNDATION
AT INACTIVE FAULT ZONE

Gibbs & Hill, Inc.

SCALE 1"=50'-0"

S-0017

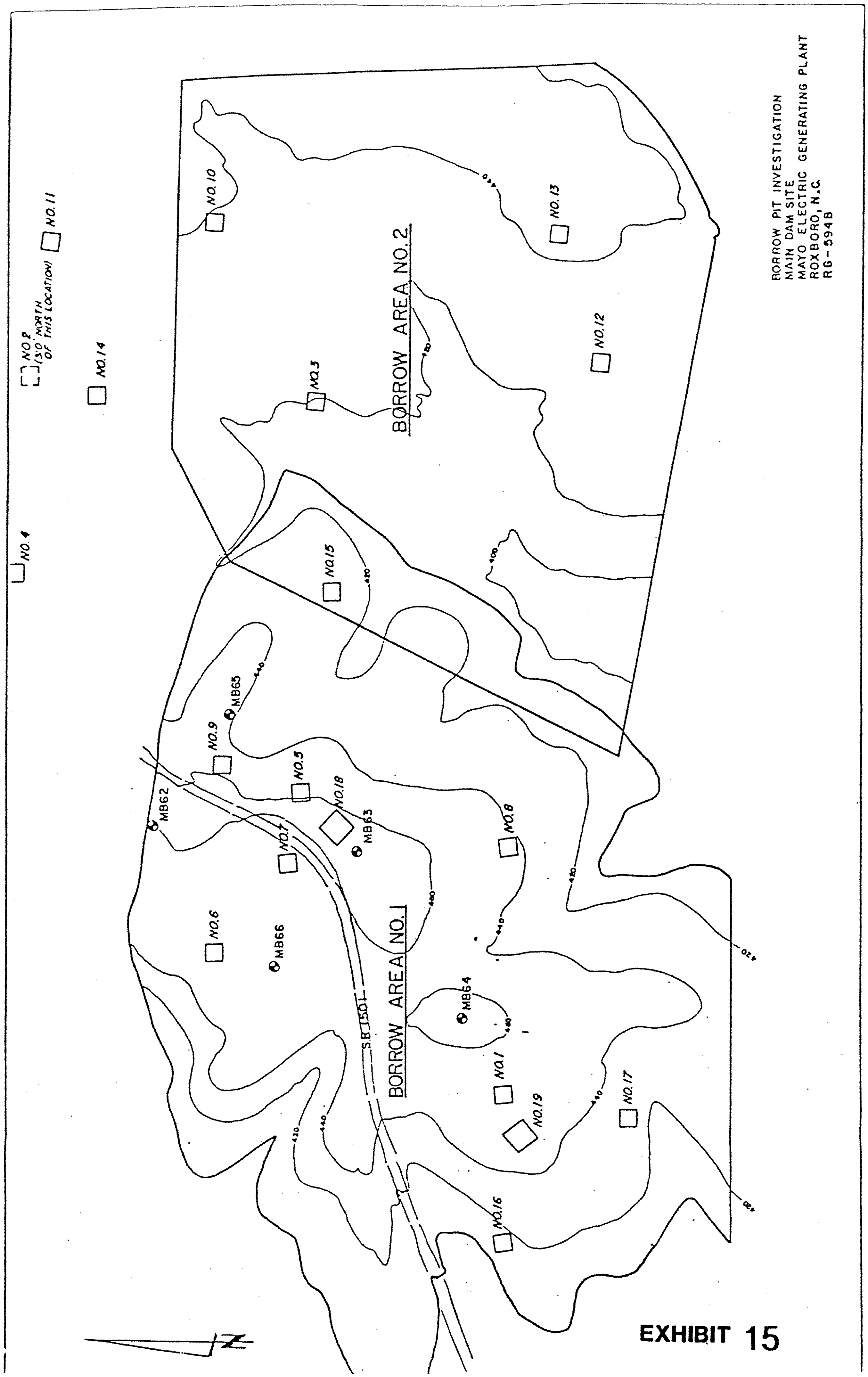
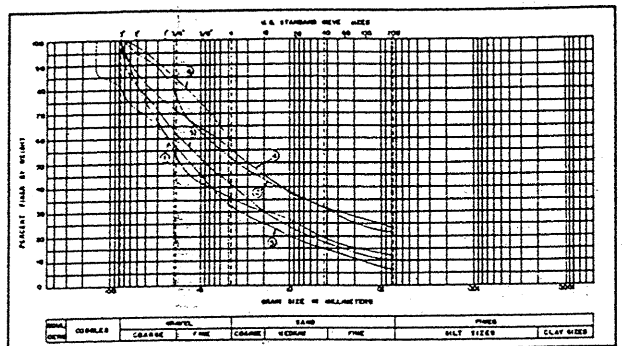
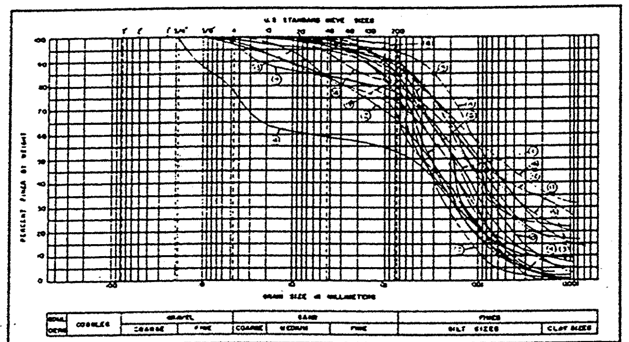

BORROW PIT INVESTIGATION
MAIN DAM SITE
MAYO ELECTRIC GENERATING PLANT
ROXBORO, N.C
RG-594B
BORROW AREA NO.2
BORROW AREA NO.1
S.R.1501
NO.2 (30' NORTH OF THIS LOCATION)
NO.1
NO.3
NO.4
NO.5
NO.6
NO.7
NO.8
NO.9
NO.10
NO.11
NO.12
NO.13
NO.14
NO.15
NO.16
NO.17
NO.18
NO.19
MB62
MB63
MB64
MB65
MB66
440
420
400

EXHIBIT 15



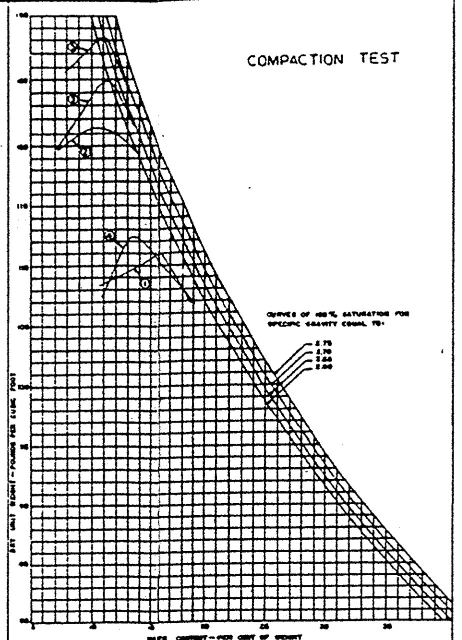
GRAIN SIZE DISTRIBUTION MATERIAL FOR RANDOM FILL

CURVE NO	BORING NO.	DEPTH	NAT WC %	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
							SEE BELOW
1	TEST PIT NEAR MB-43	10'±					WEATHERED PHYLLITE, AFTER RIPPING BY D-8 DOZER
2							WEATHERED PHYLLITE, AFTER BEING RUN OVER SEVERAL TIMES BY D-8 DOZER
3							WEATHERED PHYLLITE PRIOR TO DIRECT SHEAR TEST
4							WEATHERED PHYLLITE (FROM SHEAR ZONE) AFTER 1 CYCLE OF DIRECT SHEAR TEST WITH NORMAL PRESSURE AT 3.6 KSF
5							WEATHERED PHYLLITE, PRIOR TO TRIAXIAL SHEAR TEST
6							WEATHERED PHYLLITE, AFTER TRIAXIAL SHEAR TEST



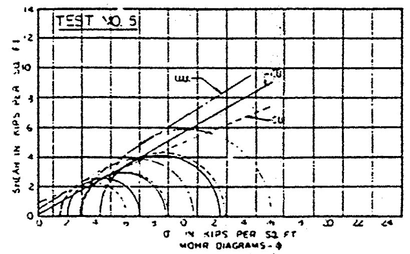
GRAIN SIZE DISTRIBUTION MATERIAL FOR CLAY CORE

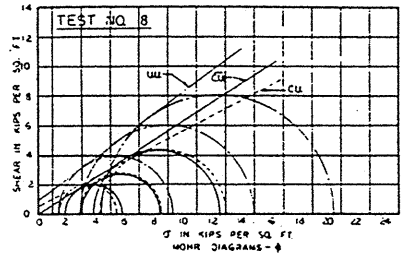
CURVE NO	BORING NO.	SAMP NO	DEPTH	NAT WC %	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
								SEE BELOW
1	MB-32	3	60/75	15.4	33	26	7	YELLOWISH TAN CLAYEY FINE TO MEDIUM SANDY SILT ML
2	MB-48	3	60/75	17	31	NP	NP	TAN FINE TO COARSE SANDY SILT ML
3	MB-43	2	35/50	14.5	35	29	7	BROWN SLIGHTLY CLAYEY FINE TO COARSE SANDY CLAYEY SILT WITH OCCASIONAL GRAVEL ML
4	MB-49	4	45/20	17.0	43	32	11	REDDISH BROWN CLAYEY FINE TO COARSE SANDY SILT WITH GRAVEL ML
5	MB-53	2	35/50	10.4	32	NP	NP	LIGHT TAN SLIGHTLY CLAYEY FINE TO MEDIUM SANDY SILT ML
6	MB-56	3	60/75	23.3	43	34	9	BROWNISH YELLOW SLIGHTLY CLAYEY FINE TO MEDIUM SANDY SILT WITH OCCASIONAL GRAVEL ML
7	MB-56	5	35/50	18.7	40	36	4	TANNISH BROWN FINE SANDY SILT ML
8	MB-60	1	0/5		48	27	21	YELLOWISH TAN SLIGHTLY FINE SANDY CLAYEY SILT ML
9	MB-60	2	35/50	18.8	36	26	10	BROWNISH TAN CLAYEY FINE TO COARSE SANDY SILT WITH TRACES OF GRAVEL ML
10	MB-60	3	10/15		35	22	13	BROWNISH TAN CLAYEY FINE SANDY SILT ML-CL
11	ES-1	2	35/50	27.2	[illegible]			DARK BROWN AND RED SLIGHTLY CLAYEY FINE TO MEDIUM SANDY SILT ML
12	ES-2	2	35/50	25.6	54	42	12	LIGHT TAN AND RED FINE TO MEDIUM SANDY CLAYEY SILT MH
13	ES-5	3	5/75	6.3	31	NP	NP	LIGHT TAN VERY SLIGHTLY CLAYEY FINE TO COARSE SANDY SILT ML
14	ES-7	2	35/5[illegible]	9.4	33	19	[illegible]	LIGHT GRAY CLAYEY FINE TO MEDIUM SANDY SILTY CLAY CL
15	ES-13	2	35/5[illegible]	29.9	52	32	20	REDDISH BROWN FINE SANDY CLAYEY SILT MH
16	ES-16	1	1/35		55	25	30	BROWNISH RED FINE TO MEDIUM SANDY SILTY CLAY CH
17	ES-16	2	35/50		51	27	24	REDDISH TAN FINE SANDY SILTY CLAY CH
18	ES-17	3	6/75	10.7	33	29	4	GRAY SLIGHTLY CLAYEY FINE TO MEDIUM SANDY SILT ML
19	ES-18	1	0/4		40	23	17	DARK REDDISH BROWN FINE TO COARSE SANDY SILTY CLAY CL

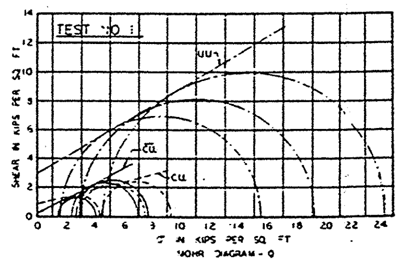


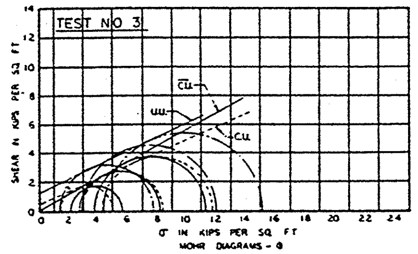
CURVE NO	MOISTURE DENSITY RELATION	METHOD OF TEST	MAX DRY DENSITY PCF	OPTIMUM MOISTURE CONTENT %	SOIL DESCRIPTION OR CLASSIFICATION AND SAMPLE LOCATION
					SEE BELOW
1	MB-56 5'-10'	ASTM D-1557 'A'	110.9	15.9	BROWNISH YELLOW SLIGHTLY CLAYEY FINE TO MEDIUM SANDY SILT
2	MB-56 15'-20'	ASTM D-1557 'A'	121.5	10.4	LIGHT TAN SLIGHTLY CLAYEY FINE TO MEDIUM SANDY SILT WITH OCCASIONAL COARSE SAND
3	MB-60 5'-10'	ASTM D-1557 'A'	124.8	11.6	YELLOWISH BROWN SLIGHTLY CLAYEY FINE SANDY SILT
4	ES-16 1'-5'	ASTM D-1557 'A'	112.6	13.5	BROWN FINE SANDY SILTY CLAY
5	ES-17	ASTM D-1557 'A'	128.3	11.0	BROWNISH GREEN FINE TO MEDIUM SANDY CLAYEY SILT

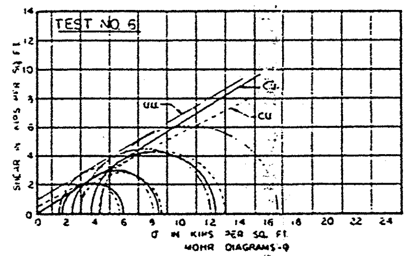
BORING & SAMPLE INFORMATION	NAT WC %	LL	PL	GRAIN SIZE D_{85} mm	GRAIN SIZE D_{15} mm	GRAIN SIZE %-200	GRAIN SIZE %-CLAY	K, Cm/Sec	MODIFIED PROCTOR γ_d PCF	MODIFIED PROCTOR W_{opt} %	STRENGTH U.U. φ	U.U. c KSF	CU(TOT) φ	CU(TOT) c KSF	CU(EFF) φ	CU(EFF) c KSF	REMARKS
MB-32 JAR AT 7.5'	15	55	7			90	8										
MB-34 JAR AT 5'	17	49	20	.10		46											
MB-34 JAR AT 7.5'	31	46	5	.06		82											
MB-40 JAR AT 2.5'	24	47	22			87											
MB-40 JAR AT 7.5'	23	57	NP	2.0		72											
MB-42 JAR AT 7.5'	12	50	5	1.5		52											
MB-46 JAR AT 7.5'	12	31	NP	.5	.0008	70	0	3×10^{-7}	134.0	9.0	30.5°	8.1	18.5°	.8	34.5°	.2	DRY
MB-46 BAG AT 5-10'								2×10^{-6}			28.5°	2.2	23.5°	.6	26.5°	.5	WET
MB-49 JAR AT 5'	14	55	7	.09	.004	82	10										
MB-49 JAR AT 10'	17	45	11	1.0	.007	55	10										
MB-53 JAR AT 5'	10	32	NP	.074	.007	85	4										
MB-56 JAR AT 7.5'	23	45	9	.1	.008	80	5	3×10^{-7}	110.9	15.9	25°	1.9	28.5°	.5	28.5°	.5	DRY
MB-56 BAG AT 5-10'								1×10^{-7}			26.5°	1.25	22.5°	.5	29.5°	0	WET
MB-56 JAR AT 15'	19	40	4	.12	.012	75	0		121.5	10.4	29.5°	1.1	23.5°	.6	32.5°	0	DRY
MB-56 BAG AT 15-20'											31.5°	.6	22°	.9	29.5°	.2	WET
ES-6 COMBINED BAGS 1-5'								5×10^{-9}	112.6	13.5	36°	2.5	19°	.3	31.5°	0	DRY
ES-6 COMBINED BAGS 1-5'								1×10^{-9}			32.5°	2.5	16.5°	.4	29°	.2	WET
MB-60 BAG AT 5-10'	19	56	10	.4	.006	75	6	5×10^{-8}	124.8	11.6	34°	2.5	24°	.4	30.5°	0	DRY
MB-60 BAG AT 5-10'								1×10^{-8}			36°	1.0	25°	.5	31°	0	WET
																	NOTE: FOR ALL STRENGTH, PERMEABILITY AND CONSOLIDATION TESTS, SAMPLES WERE REMOLDED TO 95% OF THE MODIFIED PROCTOR DRY DENSITY AT MOISTURE CONTENTS 3 PERCENTAGE POINTS BELOW OPTIMUM ("DRY") AND 3 PERCENTAGE POINTS ABOVE OPTIMUM ("WET")

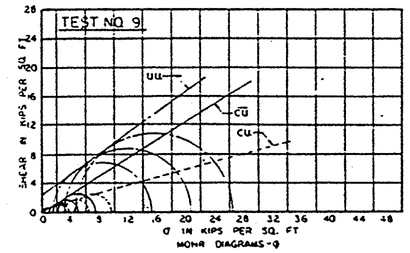


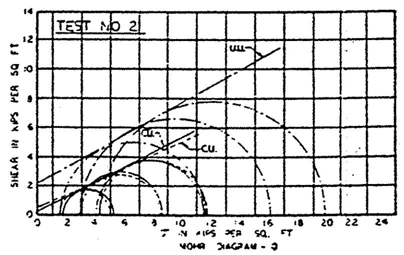


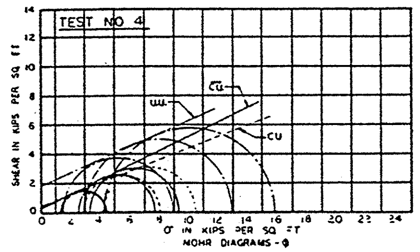


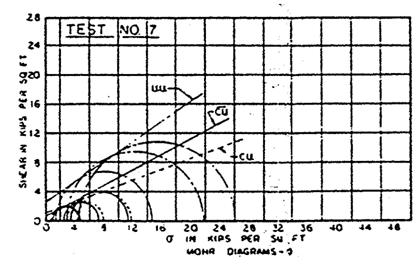


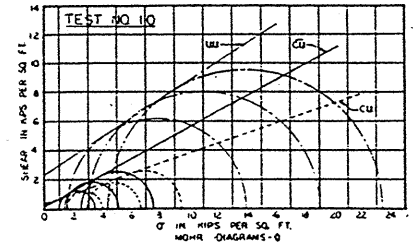


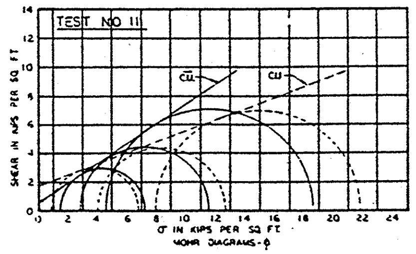












TRIAXIAL SHEAR TEST

TEST NO	BORING NO	DEPTH	DRY DENSITY PCF	MOISTURE CONTENT %	UNCONSOLIDATED UNDRAINED φ DEGREE	UNCONSOLIDATED UNDRAINED C PSF	CONSOLIDATED UNDRAINED TOTAL STRESS φ DEGREE	TOTAL STRESS C, PSF	EFFECTIVE STRESS φ DEGREE	EFFECTIVE STRESS C, PSF
1	MB-45	5-10	127.3	5.0	30.5	3100	15.5	820	31.5	200
2	MB-48	5-10	127.3	12.0	29.5	2200	23.5	600	26.5	350
3	MB-56	5-10	105.5	19.5	25.5	1250	22.5	520	29.5	0
4	MB-55	5-10	105.5	13.0	23.0	1900	20.5	550	25.5	300
5	MB-56	15-20	115.4	15.5	31.5	550	22.0	900	29.5	220
6	MB-56	15-20	115.4	7.4	29.5	1100	23.5	590	32.5	0
7	MB-60	5-10	119.0	8.6	34.0	2500	24.0	400	30.5	0
8	MB-60	5-10	116.0	14.6	36.0	1000	25.0	500	31.0	0
9	ES-15	1-5	107.0	10.5	36.0	2500	19.0	300	32.0	0
10	ES-16	1-5	107.0	16.5	32.5	2500	18.5	400	29.0	200
11	TP NEAR MB-44	5-10	124.0	7.0			21.0	3000	34.5	400

REFERENCE DRAWINGS
S-0003 MAYO CREEK DAM & RESERVOIR BORING PLAN
S-0004 MAYO CREEK DAM & RESERVOIR - AS DRILLED BORING PLAN
S-0009 MAYO CREEK DAM - PLAN & PROFILE
S-0010 MAYO CREEK DAM - TYPICAL DESIGN SECTIONS OF EMBANKMENT

TRIAXIAL SHEAR TESTS.

EXHIBIT 16

CAROLINA POWER & LIGHT COMPANY
MAYO ELECTRIC GENERATING PLANT
1983-86-1,500,000 KW INSTALLATION
UNITS 1 & 2

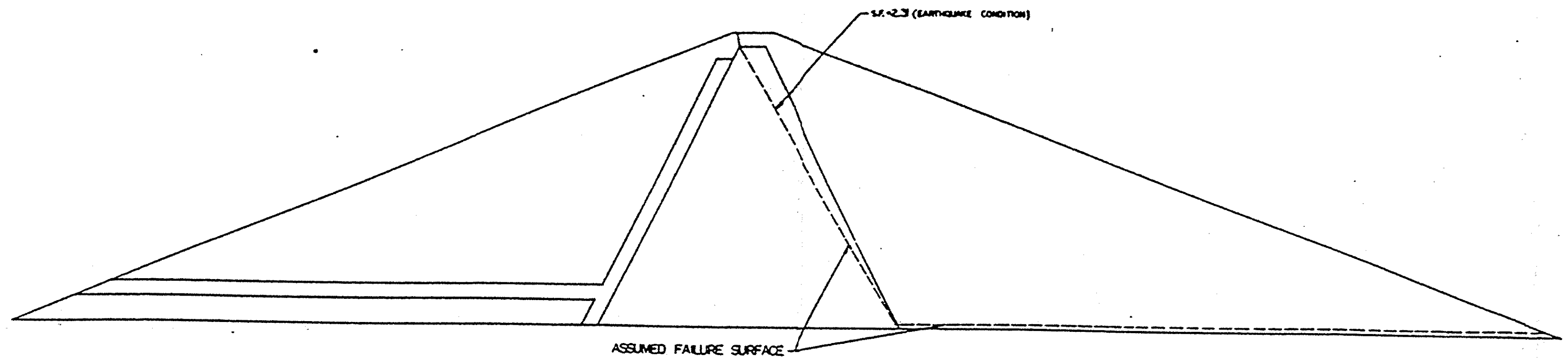
SUMMARY OF LABORATORY TEST DATA

Gibbs & Hill, Inc.

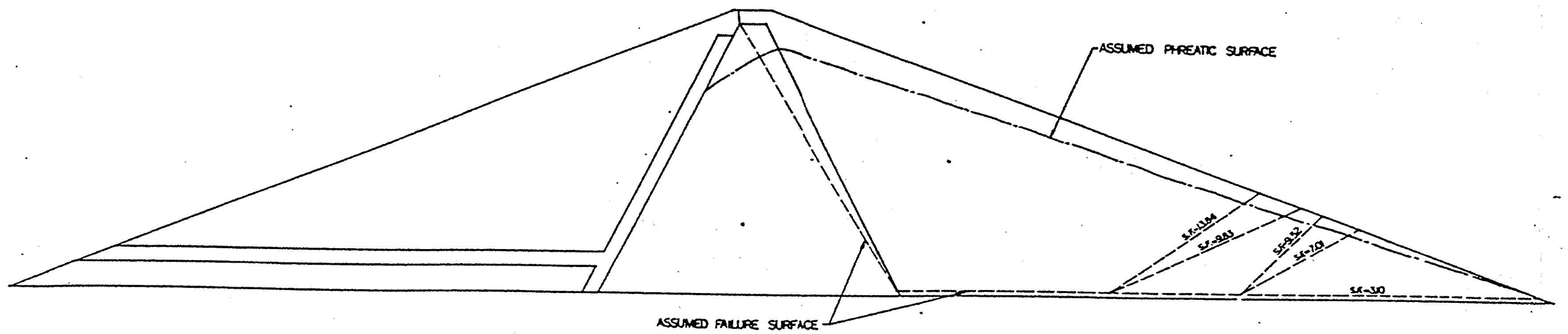
NO SCALE

S-0029

INFORMATION



CASE I - END OF CONSTRUCTION WEDGE ANALYSIS



CASE II - RAPID DRAWDOWN WEDGE ANALYSIS

SHEAR STRENGTH PARAMETERS OF CONSTRUCTION MATERIALS						
CASE	IMPERVIOUS MATERIAL		RANDOM FILL		FILTER	
	ø	c	ø	c	ø	c
END OF CONSTRUCTION	18°	1000 PSF	34°	0	35°	0
STEADY SEEPAGE	24°	0	34°	0	35°	0
RAPID DRAWDOWN	24°	0	34°	0	35°	0

REFERENCE DRAWINGS

S-0009 MAYO CREEK DAM - PLAN & PROFILE
S-0010 MAYO CREEK DAM - TYPICAL DESIGN SECTIONS OF EMBANKMENT
S-0026 MAYO CREEK DAM - STABILITY ANALYSIS UPSTREAM SLOPE SH. 2
S-0027 MAYO CREEK DAM - STABILITY ANALYSIS DOWNSTREAM SLOPE

NOTE:
SECTIONS SHOWN ARE LOOKING EAST.

EXHIBIT 17

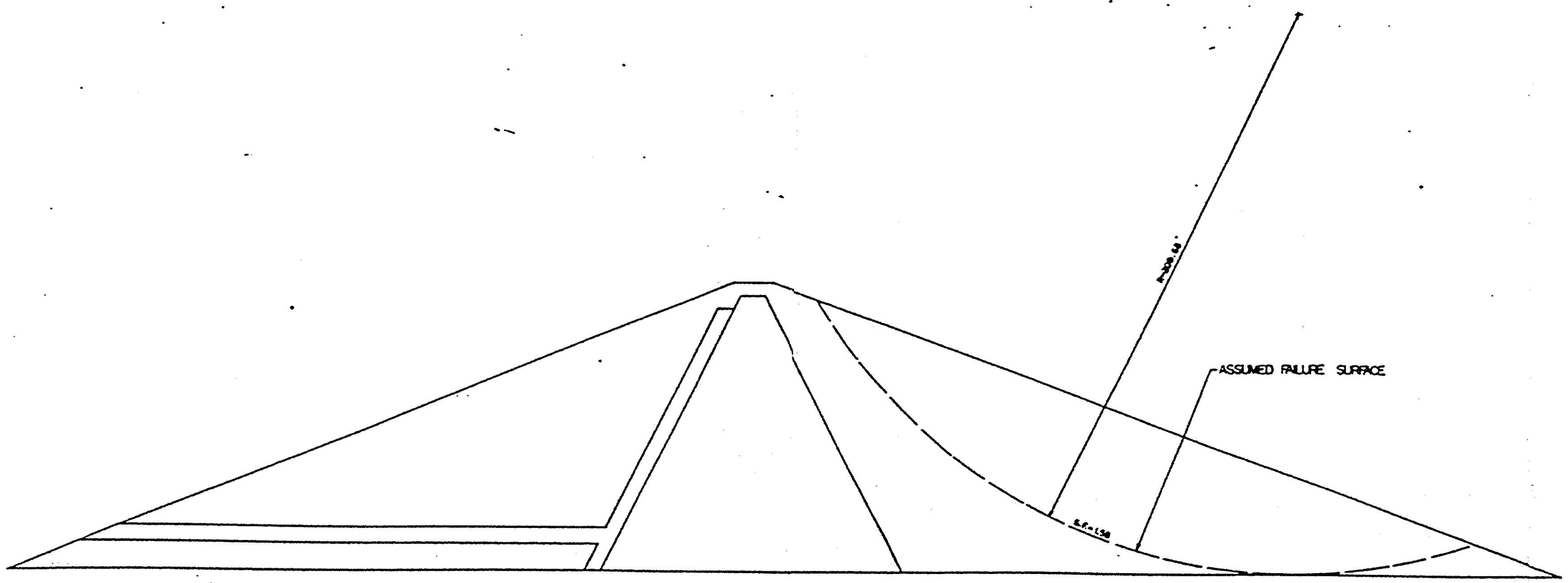
CAROLINA POWER & LIGHT COMPANY
MAYO ELECTRIC GENERATING PLANT
1983-85-1,500,000 KW INSTALLATION
UNITS 1 & 2

MAYO CREEK DAM
STABILITY ANALYSIS
UPSTREAM SLOPE SH.1

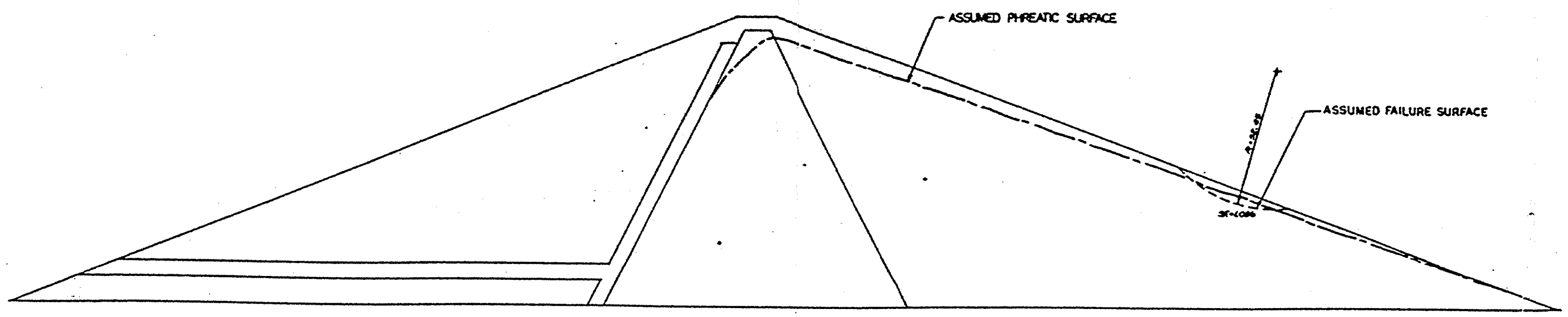
Gibbs & Hill, Inc.

1" = 20'

S-0025



CASE I END OF CONSTRUCTION



CASE II - RAPID DRAWDAWN CONDITION

REFERENCE DRAWINGS

S-0009 MAYO CREEK DAM - PLAN & PROFILE
S-0010 MAYO CREEK DAM - TYPICAL DESIGN SECTIONS OF EMBANKMENT
S-0028 MAYO CREEK DAM - STABILITY ANALYSIS UPSTREAM SLOPE SH. 1
S-0027 MAYO CREEK DAM - STABILITY ANALYSIS DOWNSTREAM SLOPE

NOTES:

1 SECTIONS SHOWN ARE LOOKING EAST.
2 FOR SHEAR STRENGTH PARAMETERS SEE DWG. S-0025

EXHIBIT 18

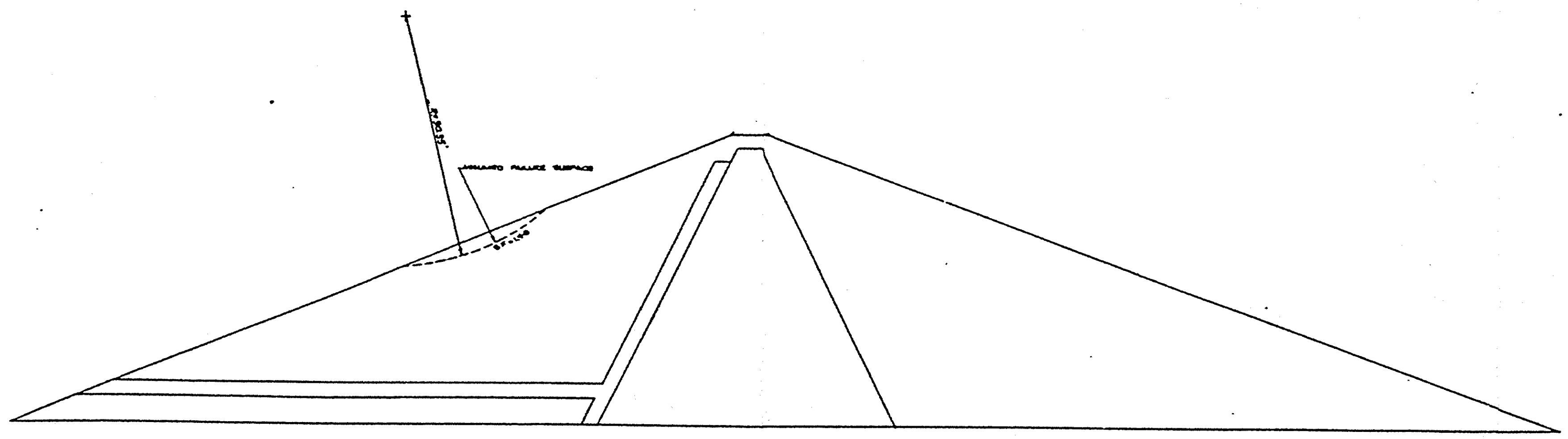
CAROLINA POWER & LIGHT COMPANY
MAYO ELECTRIC GENERATING PLANT
1983-85-1,500,000 KW INSTALLATION
UNITS 1 & 2

MAYO CREEK DAM
STABILITY ANALYSIS
UPSTREAM SLOPE SH. 2

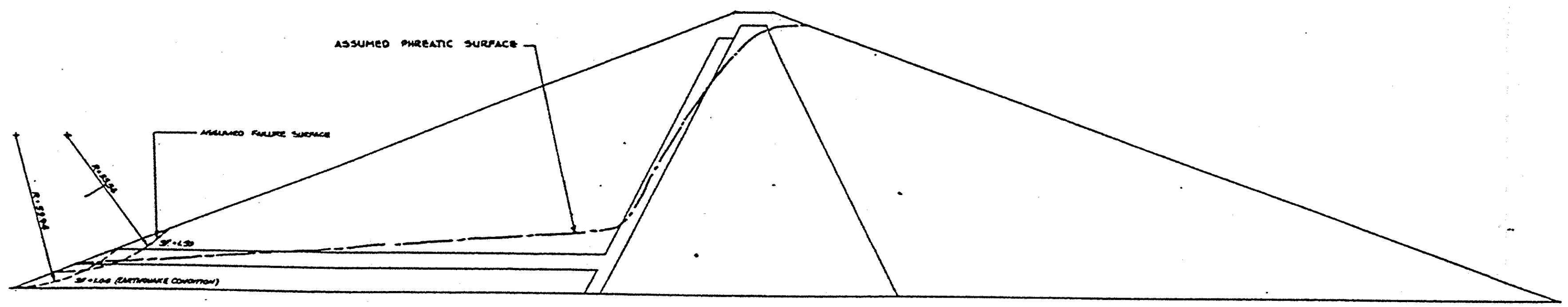
Gibbs & Hill, Inc.

1" = 20'

S-0026



CASE I END OF CONSTRUCTION



CASE II & III STEADY SEEPAGE CONDITION & EARTHQUAKE CONDITION

REFERENCE DRAWINGS

S-0009	MAYO CREEK DAM - PLAN & PROFILE
S-0010	MAYO CREEK DAM - TYPICAL DESIGN SECTIONS OF EMBANKMENT
S-0026	MAYO CREEK DAM - STABILITY ANALYSIS UPSTREAM SLOPE SH. 1
S-0066	MAYO CREEK DAM - STABILITY ANALYSIS UPSTREAM SLOPE SH. 2

NOTES:

1. SECTIONS SHOWN ARE LOOKING EAST.
2. FOR SHEAR STRENGTH PARAMETERS SEE DWG S-0025

EXHIBIT 19

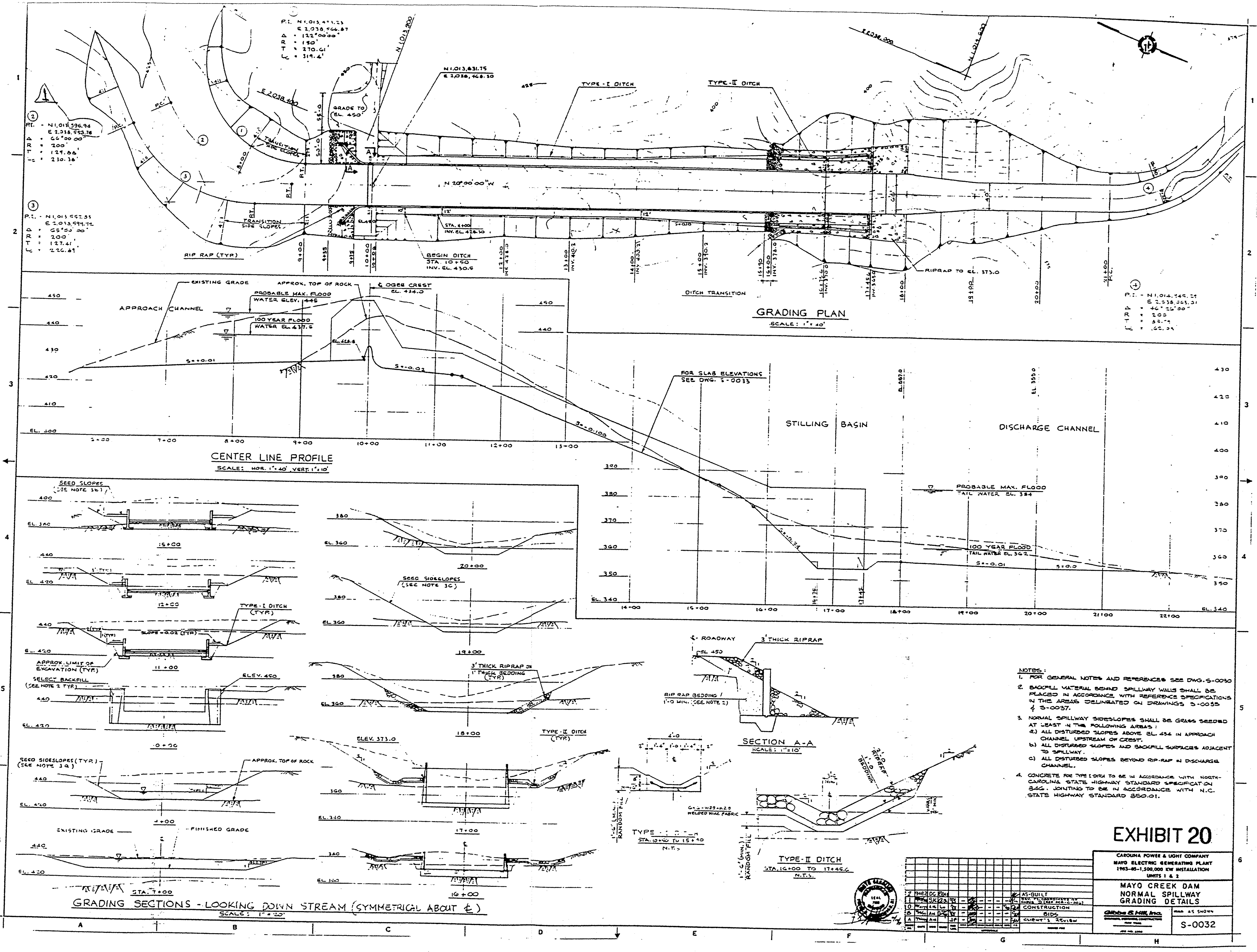
CAROLINA POWER & LIGHT COMPANY
MAYO ELECTRIC GENERATING PLANT
1983-86-1,500,000 KW INSTALLATION
UNITS 1 & 2

MAYO CREEK DAM
STABILITY ANALYSIS
DOWNSTREAM SLOPE

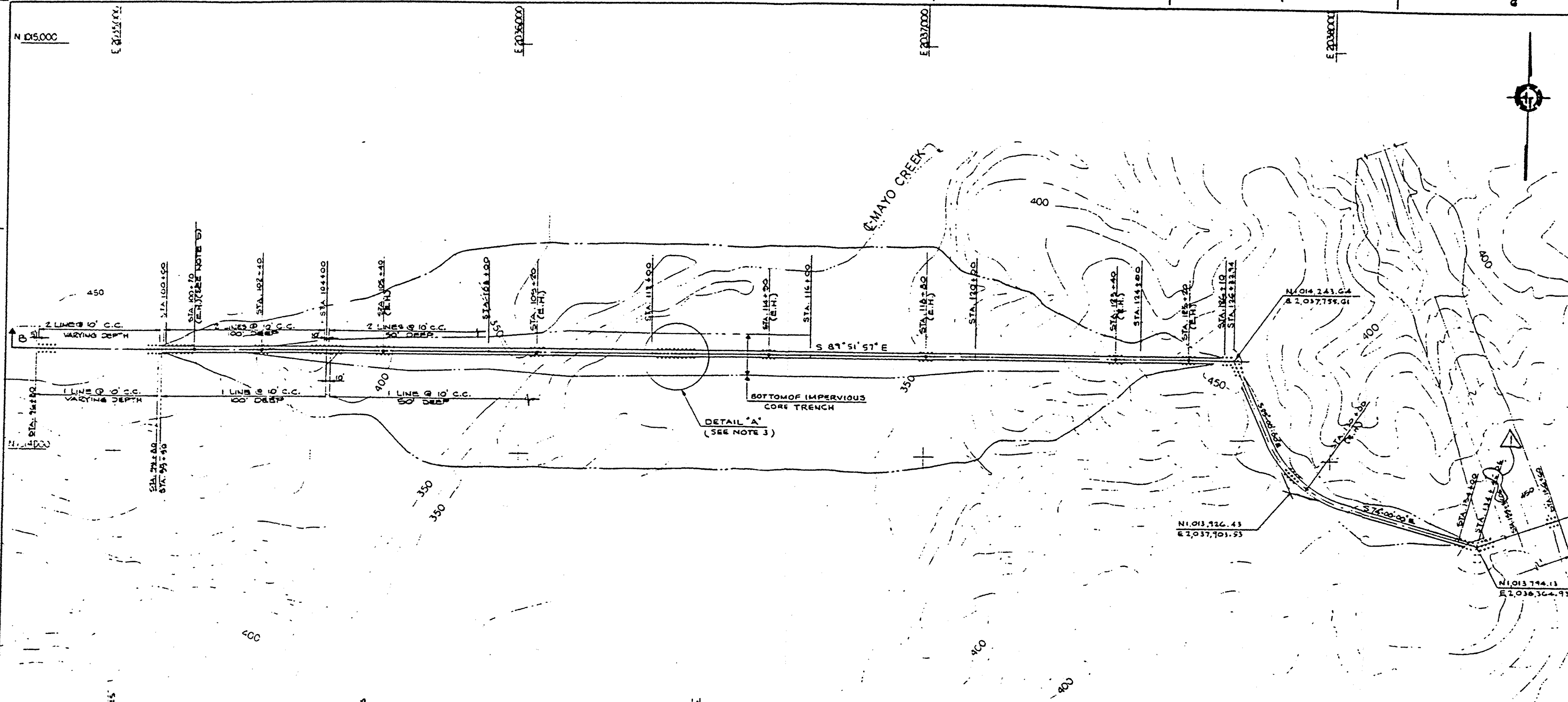
Gibbs & Hill, Inc.

SCALE 1" = 20'

S-0027

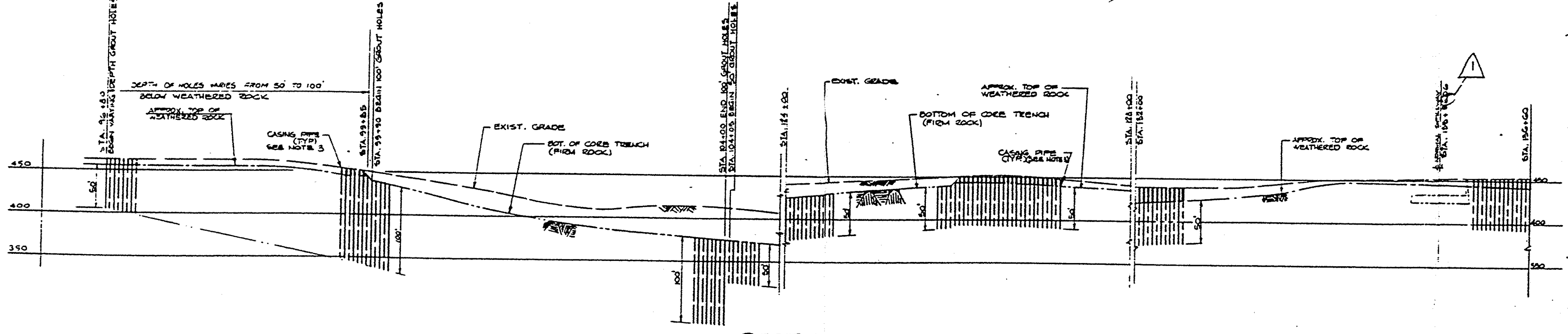


GRADING PLAN
SCALE: 1" = 40'
TYPE-I DITCH
TYPE-II DITCH
N 20°00'00" W
TRANSITION SIDE SLOPES
RIP RAP (TYP)
BEGIN DITCH
STA. 10+50
INV. EL. 430.5
DITCH TRANSITION
RIPRAP TO EL. 373.0
GRADE TO EL. 450
CENTER LINE PROFILE
SCALE: HOR. 1" = 40', VERT. 1" = 10'
EXISTING GRADE
APPROX. TOP OF ROCK
℄ OGEE CREST EL. 434.0
APPROACH CHANNEL
PROBABLE MAX. FLOOD WATER ELEV. 445
100 YEAR FLOOD WATER EL. 437.6
FOR SLAB ELEVATIONS SEE DWG. S-0033
STILLING BASIN
DISCHARGE CHANNEL
PROBABLE MAX. FLOOD TAIL WATER EL. 384
100 YEAR FLOOD TAIL WATER EL. 362
GRADING SECTIONS - LOOKING DOWN STREAM (SYMMETRICAL ABOUT ℄)
SCALE: 1" = 20'
SEED SLOPES (SEE NOTE 3C)
SEED SIDESLOPES (SEE NOTE 3C)
TYPE-I DITCH (TYP)
APPROX. LIMIT OF EXCAVATION (TYP)
SELECT BACKFILL (SEE NOTE 2 TYP)
ELEV. 450
3' THICK RIPRAP ON 1' THICK BEDDING (TYP)
TYPE-II DITCH (TYP)
ELEV. 373.0
SEED SIDESLOPES (TYP) (SEE NOTE 3a)
APPROX. TOP OF ROCK
EXISTING GRADE
FINISHED GRADE
STA. 7+00
℄ ROADWAY
3' THICK RIPRAP
RIP RAP BEDDING 1'-0 MIN. (SEE NOTE 2)
SECTION A-A
SCALE: 1" = 10'
TYPE-I DITCH
STA. 10+50 TO 15+40
N.T.S.
TYPE-II DITCH
STA. 16+00 TO 17+45.6
N.T.S.
NOTES:
1. FOR GENERAL NOTES AND REFERENCES SEE DWG. S-0030
2. BACKFILL MATERIAL BEHIND SPILLWAY WALLS SHALL BE PLACED IN ACCORDANCE WITH REFERENCE SPECIFICATIONS IN THE AREAS DELINEATED ON DRAWINGS S-0055 & S-0037.
3. NORMAL SPILLWAY SIDESLOPES SHALL BE GRASS SEEDED AT LEAST IN THE FOLLOWING AREAS:
a.) ALL DISTURBED SLOPES ABOVE EL. 434 IN APPROACH CHANNEL UPSTREAM OF CREST.
b.) ALL DISTURBED SLOPES AND BACKFILL SURFACES ADJACENT TO SPILLWAY.
c.) ALL DISTURBED SLOPES BEYOND RIP-RAP IN DISCHARGE CHANNEL.
4. CONCRETE FOR TYPE I DITCH TO BE IN ACCORDANCE WITH NORTH CAROLINA STATE HIGHWAY STANDARD SPECIFICATION 346. JOINTING TO BE IN ACCORDANCE WITH N.C. STATE HIGHWAY STANDARD 850.01.
EXHIBIT 20
AS-BUILT
CONSTRUCTION
BIDS
CLIENT'S REVIEW
CAROLINA POWER & LIGHT COMPANY
MAYO ELECTRIC GENERATING PLANT
1983-85-1,500,000 KW INSTALLATION
UNITS 1 & 2
MAYO CREEK DAM
NORMAL SPILLWAY
GRADING DETAILS
Gibbs & Hill, Inc.
AS SHOWN
S-0032



ESTIMATED GROUTING & FOUNDATION TREATMENT QUANTITIES			
DESCRIPTION	UNIT	AMOUNT	REMARKS
GROUT HOLES 50' DEEP HOLES	# HOLES	976	ACTUAL NO. OF GROUT HOLES MAY VARY
100' DEEP HOLES	# HOLES	124	
ADD'L HOLES AT INACTIVE FAULT ZONE	# HOLES	36	
VARIABLE DEPTH HOLES (36' AVG.)	# HOLES	95	
CONCRETE CLASS F	C.Y.	450	6" CAP AT INACTIVE FAULT ZONE
C2 FILTER	C.Y.	6130	AT INACTIVE FAULT ZONE ONLY

NET QUANTITIES BY FIELD



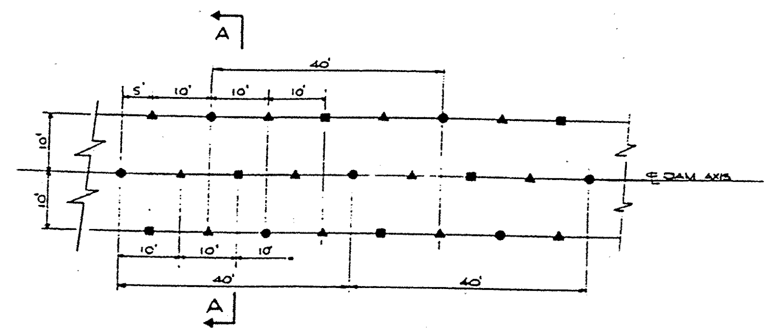
SECTION B-B
SCALE: 1"=50'-0"

GROUT HOLES IN WEST ABUTMENT

GROUT HOLES IN EAST ABUTMENT

GROUT HOLES IN SADDLE DAM

GROUT HOLES AT NORMAL SPILLWAY CREST



DETAIL A (N.T.S.)
(TYP. GROUT HOLES PATTERN IDENTIFICATION)

LEGEND
● — PRIMARY GROUT HOLE
■ — SECONDARY GROUT HOLE
▲ — TERTIARY GROUT HOLE

REFERENCE DRAWINGS

S-0009 - MAYO CREEK DAM - PLAN & PROFILE
S-0010 - MAYO CREEK DAM - TYPICAL DESIGN SECTION OF EMBANKMENT
S-0016 - MAYO CREEK DAM - GROUTING PLAN
S-0017 - MAYO CREEK DAM - TREATMENT OF FOUNDATION AT INACTIVE FAULT ZONE.
S-0018 - MAYO CREEK DAM - DRAINAGE SYSTEM
S-0030 - MAYO CREEK DAM - PLAN OF SPILLWAYS
S-0032 - MAYO CREEK DAM - NORMAL SPILLWAY GRADING DETAILS

GENERAL NOTES:

1.- FOR GROUTING PROGRAM PROCEDURES AND DETAILS COVERING DRILLING, PRESSURE TESTING, GROUTING AND RETESTING, REFER TO SPECIFICATION 2583-C-2.1-F.1, "TECHNICAL SPECIFICATION FOR CONSTRUCTION OF MAYO CREEK DAM"
2.- REFER TO DWG. S-0017 FOR GROUTING REQUIREMENTS IN INACTIVE FAULT ZONES. ONE SUCH ZONE HAS BEEN IDENTIFIED DURING THE SUBSURFACE INVESTIGATION WORK. OTHERS MAY BE UNCOVERED DURING CONSTRUCTION.
3.- ALL GROUT HOLES SHALL START FROM THE BOTTOM OF THE CORE TRENCH. EXCEPTION; GROUTING BETWEEN STA. 96+80 TO STA. 99+80 & STA. 126+10 TO STA. 136+60 SHALL BE PERFORMED FROM EXISTING GROUND SURFACE. ADEQUATE SIZE CASING SHALL BE DRIVEN THROUGH SOIL OVERBURDEN AND SEATED ON TOP OF WEATHERED ROCK TO PREVENT CAVING OF HOLE.
4.- FOR ADDITIONAL REFERENCE DRAWINGS AND SPECIFICATIONS SEE DWG. S-0009
5.- E.H. SHOWN ON 100 SCALE PLAN REPRESENTS APPROXIMATE LOCATION OF EXPLORATORY HOLE. NUMBER AND LOCATION MAY BE VARIED BY THE OWNER DURING PROGRESS OF THE WORK.

UNDER REVISION

EXHIBIT 21

2	AS-BUILT
1	
0	CONSTRUCTION
B	BIDS
A	CLIENT'S REVIEW

CAROLINA POWER & LIGHT COMPANY
MAYO ELECTRIC GENERATING PLANT
1983-86-1,500,000 KW INSTALLATION
UNITS 1 & 2

MAYO CREEK DAM
GROUTING PLAN

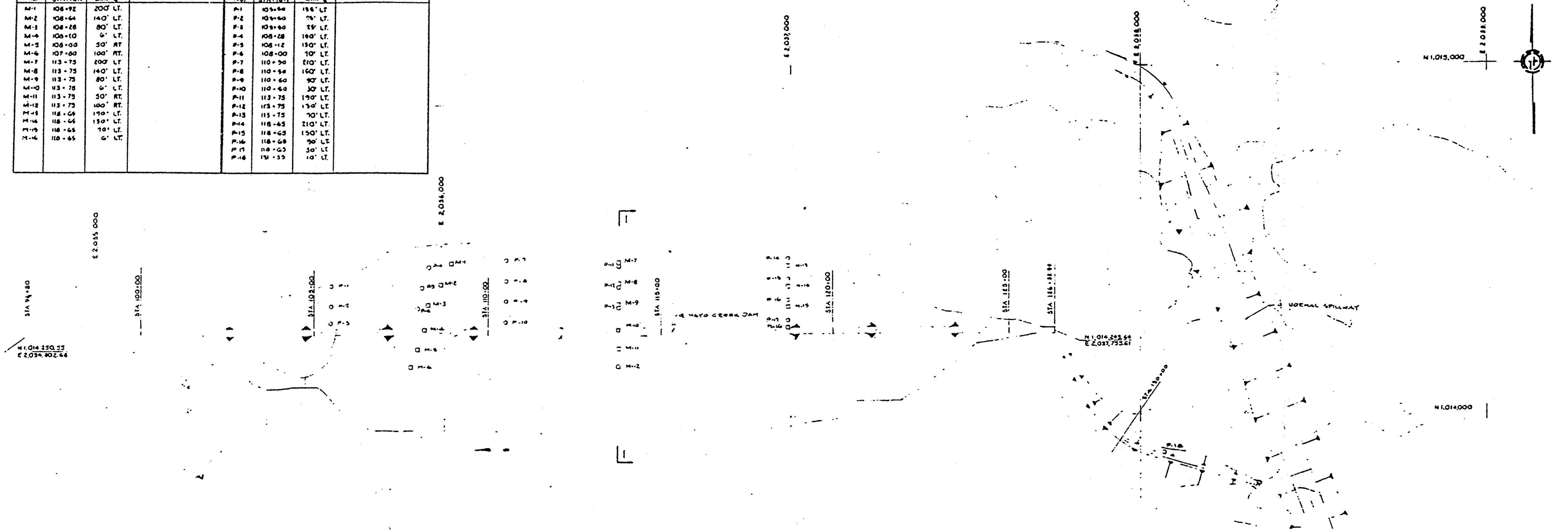
Gibbs & Hill, Inc.

SCALE 1"=100' & AS SHOWN

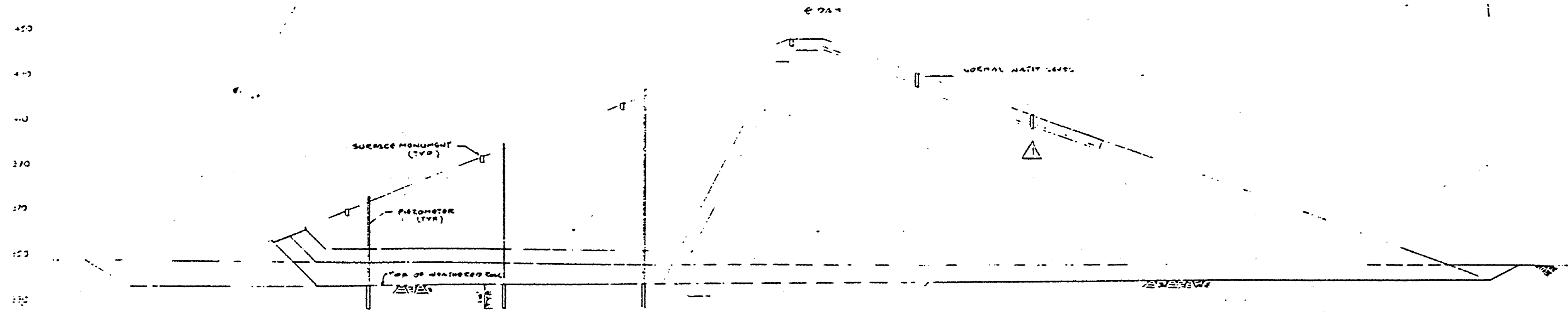
S - 0016

INSTRUMENTATION SCHEDULE

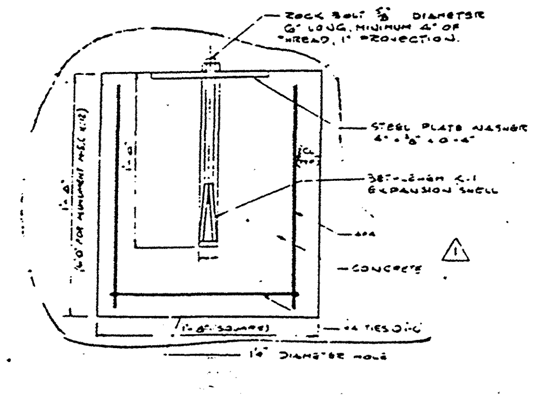
INSTR. NO.	DAM STATION	OFFSET FROM DAM ℄	REMARKS	INSTR. NO.	DAM STATION	OFFSET FROM DAM ℄	REMARKS
M-1	106+92	200' LT.		P-1	109+40	155' LT.	
M-2	108+64	140' LT.		P-2	109+40	75' LT.	
M-3	108+28	80' LT.		P-3	109+40	25' LT.	
M-4	108+10	6' LT.		P-4	108+28	140' LT.	
M-5	108+00	50' RT.		P-5	108+12	130' LT.	
M-6	107+60	100' RT.		P-6	108+00	10' LT.	
M-7	113+75	200' LT.		P-7	110+90	210' LT.	
M-8	113+75	140' LT.		P-8	110+50	160' LT.	
M-9	113+75	80' LT.		P-9	110+60	90' LT.	
M-10	113+75	6' LT.		P-10	110+60	30' LT.	
M-11	113+75	50' RT.		P-11	113+75	190' LT.	
M-12	113+75	100' RT.		P-12	113+75	130' LT.	
M-13	118+64	190' LT.		P-13	115+75	70' LT.	
M-14	118+65	130' LT.		P-14	118+45	210' LT.	
M-15	118+65	70' LT.		P-15	118+65	150' LT.	
M-16	118+65	6' LT.		P-16	118+68	90' LT.	
				P-17	118+63	30' LT.	
				P-18	151+55	10' LT.	



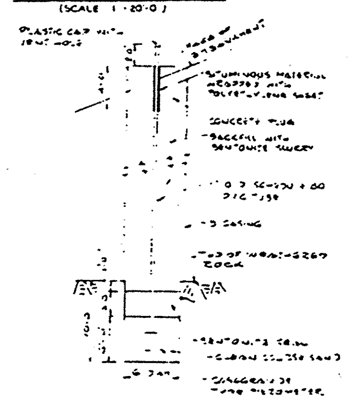
PLAN
(SCALE 1"=100'-0")



SECTION 1-1
(SCALE 1"=20'-0")



DETAIL B - TYP SURFACE MONUMENT
NO SCALE



DETAIL A - TYP PIEZOMETER
NO SCALE

REFERENCE SPECIFICATIONS:
C-21-P-1 TECHNICAL SPECIFICATION FOR THE CONSTRUCTION OF MAYO CREEK DAM
C-008 SPECIFICATION FOR EMBANKMENT INSTRUMENTATION FOR MAYO CREEK DAM.

REFERENCE DRAWINGS:
S-0009 MAYO CREEK DAM PLAN & PROFILE.

LEGEND:
□ - SURFACE MONUMENT
○ - PIEZOMETER

S-0019

EXHIBIT 22

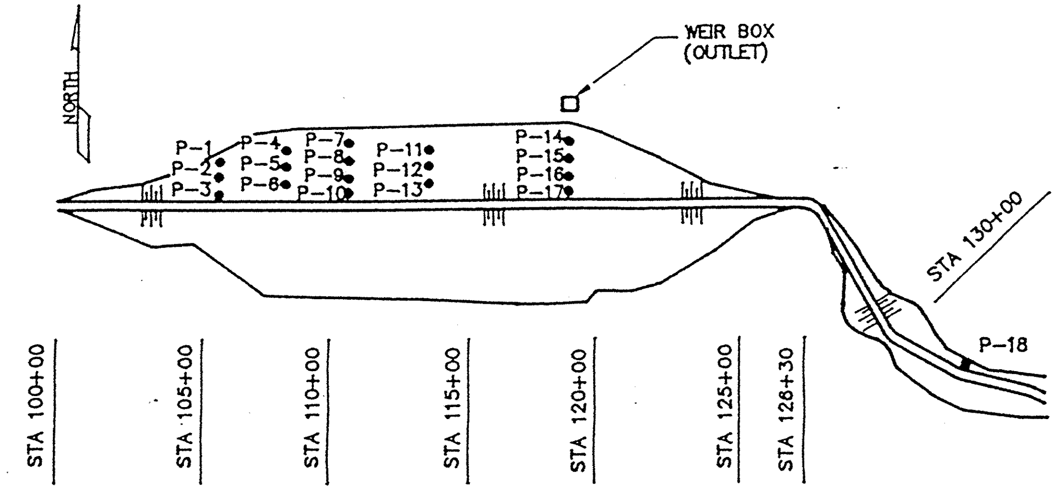
CAROLINA POWER & LIGHT COMPANY
MAYO ELECTRIC GENERATING PLANT
1983-86-1,500,000 KW INSTALLATION
UNITS 1 & 2

MAYO CREEK DAM
INSTRUMENTATION PLAN & DETAILS

Gibbs & Hill, Inc.

SCALE AS SHOWN

S-0013



PLAN VIEW OF MAIN DAM

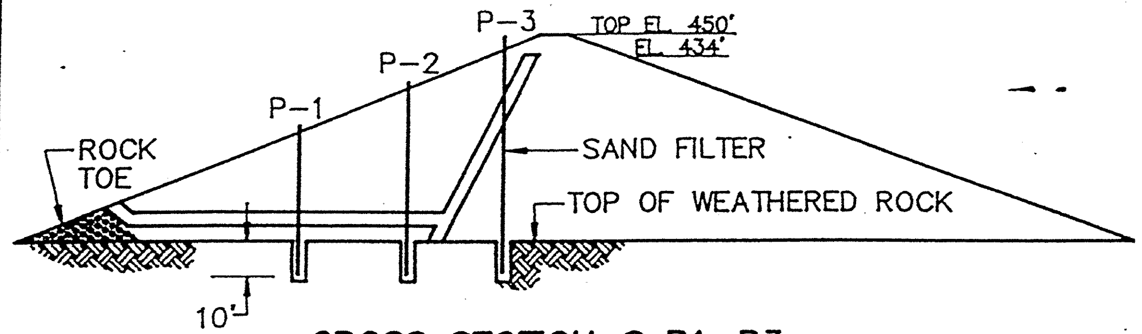
N.T.S.

MAIN DAM

PIEZOMETER SCHEDULE			
PIEZ #	STATION	HORZ. OFFSET	T.O.P.
1	105+50	135'	403.46
2	105+50	75'	426.33'
3	105+50	25'	445.27'
4	108+28	190'	378.81'
5	108+12	130'	403.78'
6	108+00	90'	426.38'
7	110+50	210'	371.00'
8	110+50	150'	395.04'
9	110+50	90'	420.60'
10	110+50	30'	444.20'
11	113+75	190'	380.49'
12	113+75	130'	403.21'
13	113+75	70'	427.43'
14	118+65	210'	372.94'
15	118+65	150'	397.47'
16	118+65	90'	420.73'
17	118+65	30'	442.17'
18	131+35	10'	451.76'

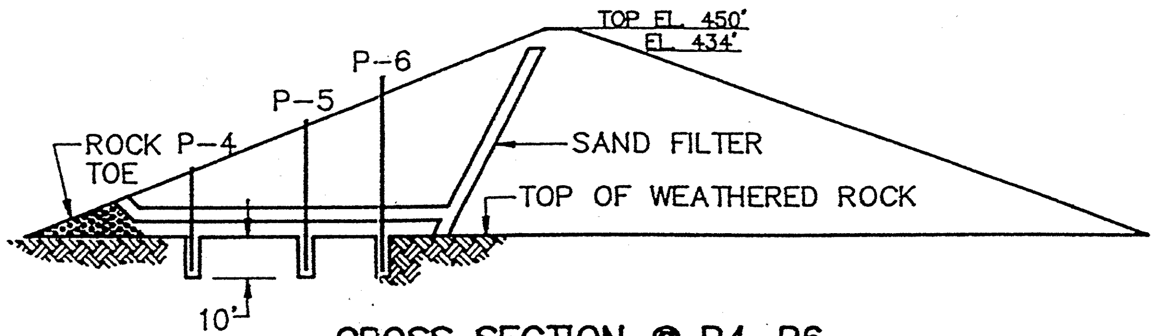
NOTES:

1. FREQUENCY OF READINGS SHALL BE AS SPECIFIED ON DRAWING D-3691, DAM MONITORING ACTIVITIES.
2. READING AND RECORDING OF THE PIEZOMETERS SHALL BE AS SPECIFIED IN MAYO EGP DAM MONITORING PROCEDURE MANUAL.
3. MAIN DAM RESERVOIR NORMAL WATER EL. 434.0'



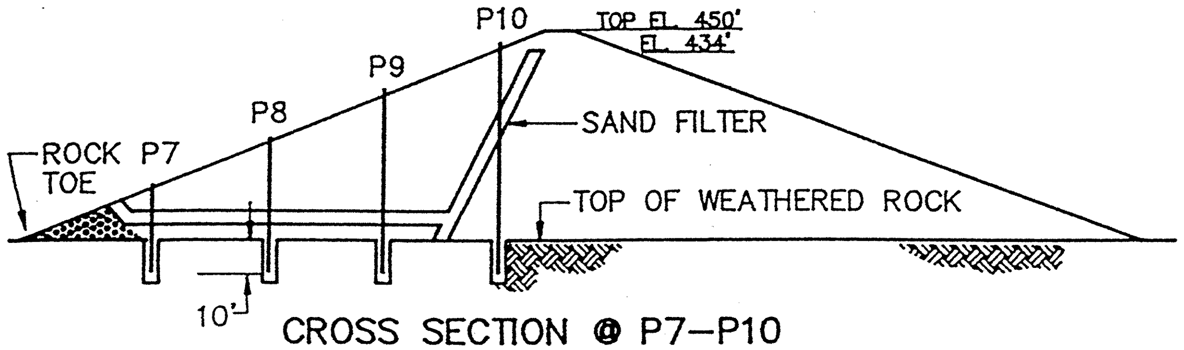
CROSS SECTION @ P1–P3

N.T.S.



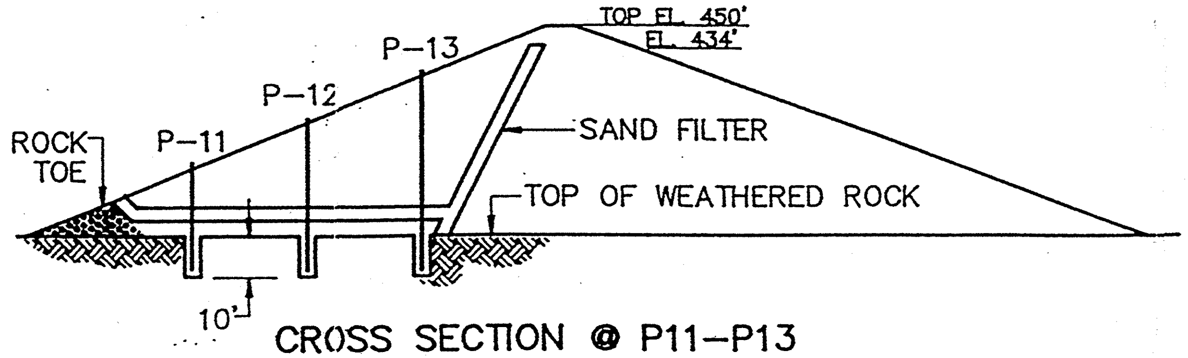
CROSS SECTION @ P4–P6

N.T.S.



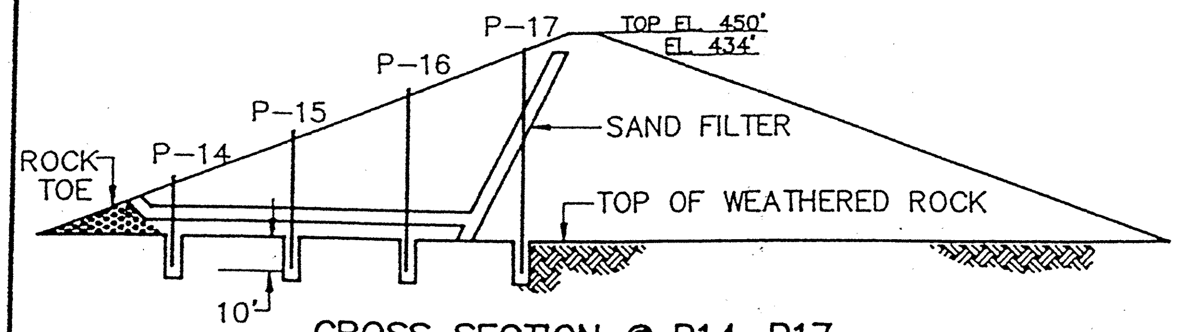
CROSS SECTION @ P7–P10

N.T.S.



CROSS SECTION @ P11–P13

N.T.S.



CROSS SECTION @ P14–P17

N.T.S.

EXHIBIT 23

CAROLINA POWER & LIGHT COMPANY
FOSSIL PLANT BETTERMENT DEPT.

MAYO ELECTRIC GENERATING PLANT
5 YEAR DAM SAFETY INSPECTION – 1989
MAIN DAM – PIEZOMETERS

SCALE N.T.S.	APPROVED	
UNIT/ CIVIL SECTION FPES		
DR. B.A. HARRIS		PAGE 1 OF 21
CH. S.B. MACQUEEN		

MAYO E.G.P.

MAIN DAM MONUMENT SURVEY DATA

EXHIBIT 24
Page 1 of 8

CP&L

Carolina Power & Light Company

Raleigh, N. C. 27602

MAYO ELECTRIC GENERATING PLANT

MAIN DAM MONUMENT SURVEY DATA

Date: April 2, 1981 Weather: Clear & Sunny

Data Collection By: Henry Letchfield

Lake Elevation: 374.0'

Monument Number	N. C. Grid Coordinates North	East	Elevation
1	1,014,447.58	2,036,040.42	373.855
2	1,014,386.47	2,036,007.19	398.740
3	1,014,330.41	2,035,966.76	421.540
4	1,014,255.47	2,035,951.24	449.895
5	1,014,197.67	2,035,921.10	437.430
6	1,014,147.65	2,035,895.84	419.79
7	1,014,447.25	2,036,489.42	373.245
8	1,014,386.60	2,036,489.52	397.830
9	1,014,324.78	2,036,490.54	423.270
10	1,014,256.36	2,036,492.48	450.485
11	1,014,191.85	2,036,494.23	434.470
12	1,014,147.32	2,036,494.83	417.570
13	1,014,437.48	2,037,000.72	377.535
14	1,014,376.70	2,037,001.35	402.445
15	1,014,315.94	2,037,001.42	426.295
16	1,014,252.96	2,037,001.92	451.125

Control Station	1,014,243.74	2,037,713.07	

EXHIBIT 24
Page 2 of 8

CP&L

Carolina Power & Light Company

Raleigh, N. C. 27602

MAYO ELECTRIC GENERATING PLANT
MAIN DAM MONUMENT SURVEY DATA

Date: APRIL 16, 1982 Weather: CLEAR & SUNNY

Data Collection By: HENRY LETCHFIELD

Lake Elevation: 406.5'

Monument Number	N. C. Grid Coordinates North	East	Elevation
1	1,014,447.68	2,036,040.3	373.902
2	1,014,386.36	2,036,007.0	398.776
3	1,014,330.45	2,035,966.6	421.613
4	1,014,255.38	2,035,451.11	449.895
5	1,014,197.66	2,035,920.94	437.443
6	1,014,147.51	2,035,895.71	419.864
7	1,014,447.30	2,036,489.3	373.313
8	1,014,386.60	2,036,489.41	397.892
9	1,014,324.73	2,036,490.4	423.341
10	1,014,256.36	2,036,492.39	450.487
11	1,014,191.90	2,036,494.12	434.476
12	1,014,147.37	2,036,494.73	417.659
13	1,014,437.45	2,037,000.62	377.601
14	1,014,376.70	2,037,001.25	402.582
15	1,014,315.94	2,037,001.34	426.339
16	1,014,352.91	2,037,001.74	451.111

Control Station	1,014,243.74	2,037,713.0	

EXHIBIT 24
Page 3 of 8

CP&L
Carolina Power & Light Company
Raleigh, N. C. 27602

MAYO ELECTRIC GENERATING PLANT
MAIN DAM MONUMENT SURVEY DATA

Date: June 17, 1982 Weather: Clear & Sunny
Data Collection By: Henry Letchfield

Lake Elevation: 412.0'

Monument Number	N. C. Grid Coordinates North	East	Elevation
1	1,014,447.66	2,036,040.42	373.925
2	1,014,386.52	2,036,007.18	398.790
3	1,014,330.46	2,035,966.55	421.611
4	1,014,255.43	2,035,951.21	449.895
5	1,014,197.62	2,035,921.04	437.434
6	1,014,147.60	2,035,895.82	419.874
7	1,014,447.25	2,036,489.40	373.337
8	1,014,386.63	2,036,489.50	397.903
9	1,014,324.78	2,036,490.53	423.338
10	1,014,256.36	2,036,492.46	450.482
11	1,014,191.90	2,036,494.20	434.480
12	1,014,147.34	2,036,494.81	417.664
13	1,014,437.53	2,037,000.69	377.626
14	1,014,376.74	2,037,001.31	402.525
15	1,014,315.99	2,037,001.38	426.327
16	1,014,252.98	2,037,001.79	451.113

Control Station			

EXHIBIT 24
Page 4 of 8

CP&L
Carolina Power & Light Company
Raleigh, N. C. 27602

MAYO ELECTRIC GENERATING PLANT
MAIN DAM MONUMENT SURVEY DATA

Date: December 10, 1984 Weather: Clear

Data Collection By: Smith & Smith Surveyors

Lake Elevation: 432.0'

Monument Number	N. C. Grid Coordinates North	East	Elevation
1	1,014,447.47	2,036,040.12	374.009
2	1,014,386.38	2,036,006.83	398.855
3	1,014,330.37	2,035,966.29	421.687
4	1,014,255.38	2,035,950.72	449.975
5	1,014,197.51	2,035,920.56	437.547
6	—	—	*
7	1,014,447.14	2,036,489.12	373.435
8	1,014,386.59	2,036,489.12	397.986
9	1,014,324.76	2,036,490.07	423.427
10	1,014,256.49	2,036,491.96	450.702
11	1,014,191.78	2,036,493.70	434.603
12	—	—	*
13	1,014,437.37	2,037,000.38	377.757
14	1,014,376.66	2,037,000.92	402.616
15	1,014,315.96	2,037,000.97	426.411
16	1,014,252.92	2,037,001.27	451.222

Control Station	1009881.61	2032158.09	

EXHIBIT 24
Page 5 of 8

* Elevation of monument
below normal lake level

SCHEDULE OF SURVEY DATA

MAYO ELECTRIC GENERATING PLANT
MAIN DAM MONUMENT SURVEY
DATE: APRIL 3, 1989 WEATHER: CLOUDY, 65°

MONUMENT NUMBER	NORTH CAROLINA GRID COORDINATES NORTH	EAST	ELEVATION
1	1,014,477.860	2,036,039.820	373.986
2	1.014,386.813	2,036,006.535	398.816
3	1,014,330.745	2,035,966.012	421.633
4	1,014,255.767	2,035,950.392	449.931
5	1,014,197.860	2,035,920.285	437.528
7	1,014,447.609	2,036,488.834	373.406
8	1,014,387.035	2,036,488.855	397.948
9	1,014,325.186	2,036,489.813	423.383
10	1,014,257.075	2,036,491.725	450.653
13	1,014,437.934	2,037,000.081	377.706
14	1,014,377.180	2,037,000.611	402.576
15	1,014,316.495	2,037,000.640	426.381
16	1,014,253.474	2,037,001.029	451.196

Lake Elevation: 434.4

Main Dam
Control Station #1: N = 1,014,194.0431 E = 2,034,955.7883
Elevation = 460.848

Control Station #2: N = 1,014,309.8346 E = 2,037,775.9617
Elevation = 448.203

MAYO ELECTRIC GENERATING PLANT
SUMMARY OF MAIN DAM MONUMENT SURVEY DATA

Monument No.	N.C. Grid Coord. North	N.C. Grid Coord. East	4/2/81 Base	4/16/82 △	6/17/82 △	12/10/84 △
1	1,014,447.58	2,036,040.42	373.855	+0.047	+0.070	+0.154
2	1,014,386.47	2,036,007.19	398.740	+0.036	+0.05	+0.115
3	1,014,330.41	2,035,966.76	421.540	+0.073	+0.071	+0.147
4	1,014,255.47	2,035,951.24	449.895	0.0	0.0	+0.080
5	1,014,197.67	2,035,921.10	437.430	+0.013	+0.004	+0.117
6	1,014,147.65	2,035,895.84	419.790	+0.073	+0.084	+ *
7	1,014,447.25	2,036,489.42	373.245	+0.068	+0.092	+0.190
8	1,014,386.60	2,036,489.52	397.830	+0.062	+0.073	+0.156
9	1,014,324.78	2,036,490.54	423.270	+0.071	+0.068	+0.157
10	1,014,256.36	2,036,492.48	450.485	+0.002	-0.003	+0.217
11	1,014,191.85	2,036,494.23	434.470	+0.006	+0.010	+0.133
12	1,014,147.32	2,036,494.83	417.570	+0.089	+0.094	*
13	1,014,437.48	2,037,000.72	377.535	+0.066	+0.091	+0.222
14	1,014,376.70	2,037,001.35	402.445	+0.137	+0.080	+0.171
15	1,014,315.94	2,037,001.42	426.295	+0.044	+0.032	+0.116
16	1,014,252.96	2,037,001.92	451.125	-0.014	-0.012	+0.097

* Elevation of Monument Below Normal Lake Level.

SUMMARY OF HORIZONTAL MOVEMENTS

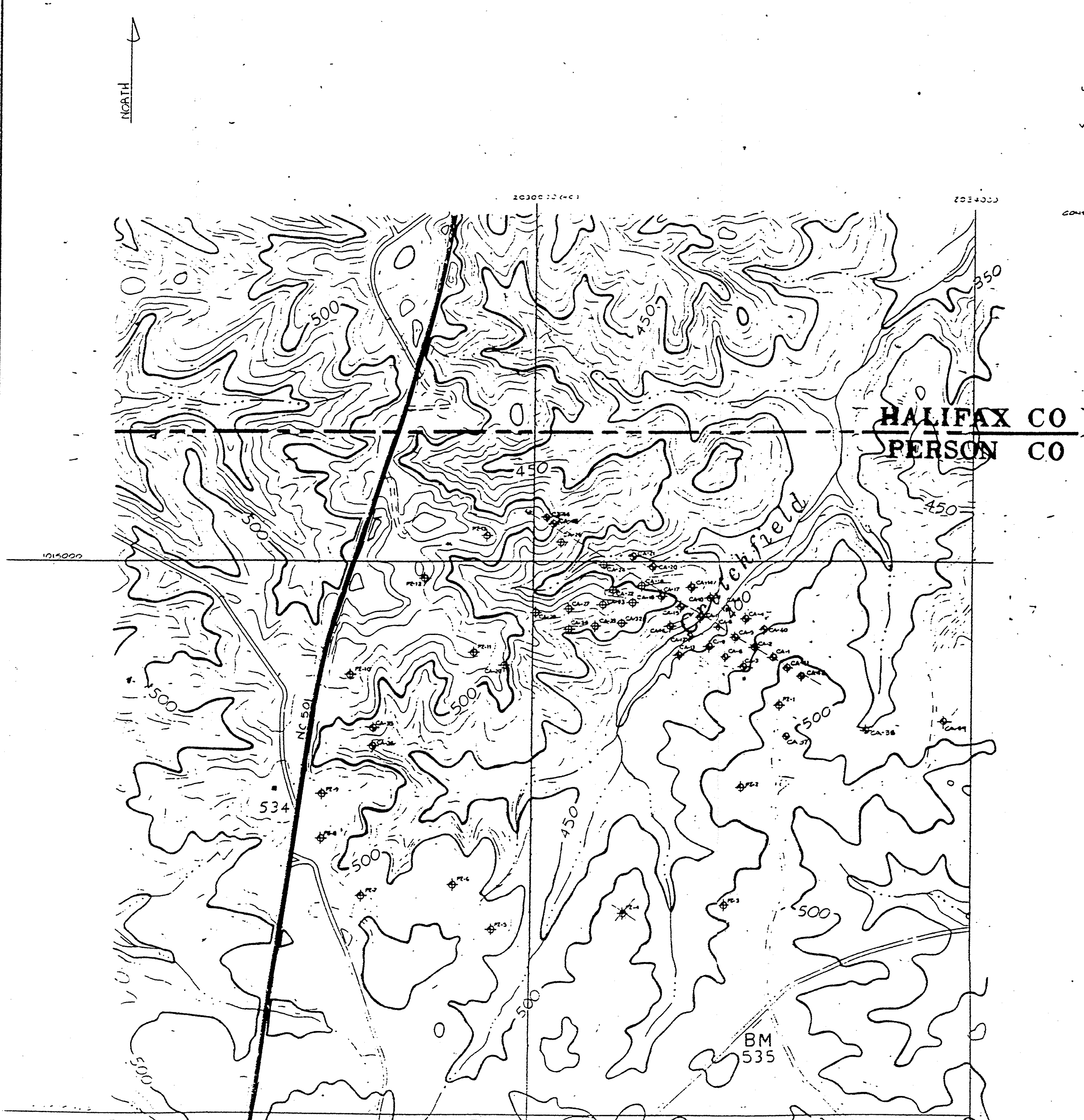
CHANGE ON DATE SHOWN

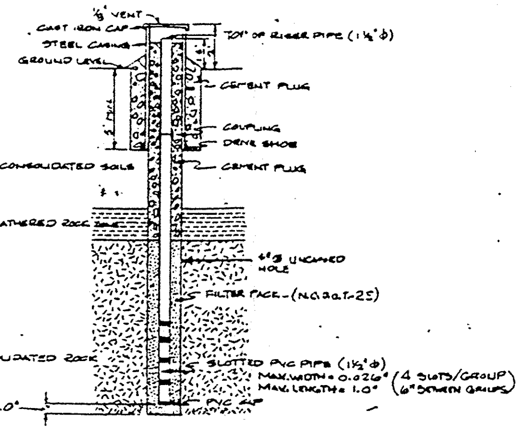
MONUMENT NO.	NORTH (INITIAL)	4/16/82	6/17/82	12/10/84	3/30/89
1	1,014,447.58	+0.1	+0.08	-0.11	+10.28
2	1,014,386.47	-0.11	+0.05	-0.09	+ 0.343
3	1,014,330.41	+0.04	+0.05	-0.04	+ 0.335
4	1,014,255.47	-0.09	-0.04	-0.09	+ 0.297
5	1,014,197.67	-0.01	-0.05	-0.16	+ 0.190
6	1,014,147.65	-0.14	-0.05	*	*
7	1,014,447.25	+0.05	0	-0.11	+ 0.359
8	1,014,386.60	0	+0.03	-0.01	+ 0.435
9	1,014,324.78	-0.05	0	-0.02	+ 0.406
10	1,014,256.36	0	0	+0.13	+ 0.715
11	1,014,191.85	+0.05	+0.05	-0.07	*
12	1,014,147.32	+0.05	+0.02	*	*
13	1,014,437.48	-0.03	+0.05	-0.11	+0.454
14	1,014,376.70	0	+0.04	-0.04	+0.480
15	1,014,315.94	0	+0.05	+0.02	+0.555
16	1,014,252.96	-0.05	+0.02	-0.04	+0.514

MONUMENT NO.	EAST (INITIAL)	4/16/82	6/17/82	12/10/84	3/30/89
1	2,036,040.42	-0.12	0	-0.3	-0.60
2	2,036,007.19	-0.19	-0.01	-0.36	-0.655
3	2,035,966.76	-0.16	-0.21	-0.47	-0.748
4	2,035,951.24	-500.13	-0.03	-0.52	-0.848
5	2,035,921.10	-0.16	-0.06	-0.54	-0.815
6	2,035,895.84	-0.13	-0.02	*	*
7	2,036,489.42	-0.12	-0.02	-0.3	-0.586
8	2,036,489.52	-0.11	-0.02	-0.4	-0.665
9	2,036,490.54	-0.14	-0.01	-0.47	-0.727
10	2,036,492.48	-0.09	-0.02	-0.52	-0.755
11	2,036,494.23	-0.11	-0.03	-0.53	*
12	2,036,494.83	-0.10	-0.02	*	*
13	2,037,000.72	-0.10	-0.03	-0.34	-0.639
14	2,037,001.35	-0.10	-0.04	-0.43	-0.739
15	2,037,001.42	-0.08	-0.04	-0.45	-0.78
16	2,037,001.92	-0.18	-0.13	-0.65	-1.891

INITIAL SURVEY ON APRIL 2, 1981
FOR NORTH, + INDICATES MOVEMENT NORTHWARD
FOR EAST, + INDICATES MOVEMENT EASTWARD
* MONUMENT BELOW WATER

EXHIBIT 24
Page 8 of 8





TYPICAL PIEZOMETER INSTALLATION

NOTE: CASING CAP MUST BE DETACHABLE 12" ABOVE THE GROUND OR HIGHER TO FACILITATE READING PIEZOMETERS.

BORING SEQUENCE (SEE NOTE 7)

SEQUENCE	BORING NO.	BORING DEPTH	REMARKS
1	CA-1	100'	
2	CA-2	50'	
3	CA-5	100'	
4	CA-8	50'	
5	CA-11	100'	
6	CA-15	100'	
7	CA-17	100'	
8	PZ-1	50'	
9	PZ-2	60'	
10	PZ-3	40'	
11	PZ-4	60'	
12	PZ-5	60'	
13	PZ-6	60'	
14	PZ-7	60'	
15	PZ-8	60'	
16	PZ-9	60'	
17	PZ-10	70'	
18	PZ-11	60'	
19	PZ-12	50'	
20	PZ-13	50'	

BORING SCHEDULE

BORING NO.	CO-ORDINATES NORTH	CO-ORDINATES EAST	DEPTH OF BORING	REMARKS	TYPE
CA-1	1014120	2032220	100'		WPT
CA-2	1014220	2032040	50'		WPT
CA-3	1014085	2031940	50'		
CA-4	1014480	2031970	50'		
CA-5	1014810	2031870	100'		WPT
CA-6	1014155	2031770	50'		
CA-7	1014560	2031800	50'		
CA-8	1014415	2031690	50'		WPT
CA-9	1014240	2031590	50'		
CA-10	1014680	2031620	50'		
CA-11	1014520	2031520	100'		WPT
CA-12	1014340	2031415	50'		
CA-13	1014145	2031325	50'		
CA-14	1014770	2031435	50'		
CA-15	1014610	2031345	100'		WPT
CA-16	1014440	2031240	50'		
CA-17	1014710	2031180	100'		WPT
CA-18	1014836	2031002	51.2'	COMPLETED 1974	
CA-19	1014651	2030913	53.3'	COMPLETED 1974	
CA-20	1014955	2031085	50'		
CA-21	1015050	2030905	50'		
CA-22	1014738	2030726	64.5'	COMPLETED 1974	WPT
CA-23	1014623	2030609	51.0'	COMPLETED 1974	
CA-24	1015004	2030658	29.4'	COMPLETED 1974	WPT
CA-25	—	—	—	NOT USED	
CA-26	1015209	2030510	69.0'	COMPLETED 1974	
CA-27	1014611	2030320	70.0'	COMPLETED 1974	WPT
CA-28	1014573	2030023	51.7'	COMPLETED 1974	
CA-29	1014044	2029743	81.5'	COMPLETED 1974	
CA-30	—	—	—	NOT USED	
CA-31	—	—	—	NOT USED	
CA-32	1014416	2030892	60.0'	COMPLETED 1974	WPT
CA-33	1014429	2030595	59.8'	COMPLETED 1974	
CA-34	1014467	2030302	20.5'	COMPLETED 1974	
CA-35	1013470	2028645	40.0'		
CA-36	1015325	2028565	40.0'		
CA-37			100.0'		WPT
CA-38			50.0'		WPT
CA-39			100.0'		WPT
CA-40			50.0'		WPT

BORING SCHEDULE

BORING NO.	CO-ORDINATES NORTH	CO-ORDINATES EAST	DEPTH OF BORING	REMARKS	TYPE
PZ-1	1013680	2032280	50'		
PZ-2	1012945	2031935	60'		
PZ-3	1011930	2031780	40'		
PZ-4	1011870	2030830	60'	DESTROYED	
PZ-5	1011715	2029645	60'		
PZ-6	1012125	2029285	60'		
PZ-7	1012026	2028465	60'		
PZ-8	1012540	2028100	60'		
PZ-9	1012980	2028105	60'		
PZ-10	1013955	2028955	70'		
PZ-11	1014165	2029460	60'		
PZ-12	1014850	2029015	50'		
PZ-13	1015235	2029575	50'		
CA-41	1014025	2032350	50'		
CA-42	1013945	2032475	50'		WPT
CA-43	1015345	2030185	50'		
CA-44	1015400	2030105	50'		WPT

NOTES

1. BORING LOCATION COORDINATES LISTED IN BORING SCHEDULES ARE BASED ON NORTH CAROLINA STATE PLANE GRID COORDINATE SYSTEM
2. ALL BORINGS SHALL BE MADE IN ACCORDANCE WITH CP&L SPECIFICATION NO. PPCD-79-5-005 SUBSURFACE INVESTIGATION DRILLING AND TE...
3. ALL BORINGS DESIGNATED BY THIS SYMBOL REFER TO TYPE III BORINGS DESCRIBED IN THE CP&L SPECIFICATION NO. PPCD-79-5-005.
   ALL BORINGS DESIGNATED BY THIS SYMBOL REFER TO TYPE III BORINGS ... JULY, 1974.
4. ALL BORINGS DESIGNATED BY THIS SYMBOL DENOTE BORING HOLES WHERE PERMANENT PIEZOMETER INSTALLATIONS ARE REQUIRED, SEE TYPICAL PIEZOMETER INSTALLATION (C,14)
5. PIEZOMETERS ARE TO HAVE 10 FEET OF 1½ INCH DIAMETER SLOTTED PVC PIPE AT BASE WITH 1½ INCH DIAMETER PLAIN PVC PIPE TO THE SURFACE, CAPPED AT BOTH ENDS AS SHOWN, AND HAVE FILTER PACK PLACED A... AS SHOWN
6. WPT DESIGNATION INDICATES BORING IS TO BE WATER PRESSURE TESTED AT 10 FOOT DEPTH INTERVALS
7. ADDITIONAL BORINGS, EXCEPT AS SHOWN ON ... WILL BE ... IN WRITING AS REQUIRED ...
8. ALL BORINGS DESIGNATED BY THIS SYMBOL REFER TO TYPE II BORINGS DESCRIBED IN THE CP&L SPECIFICATION NO. PPCD-79-5-005

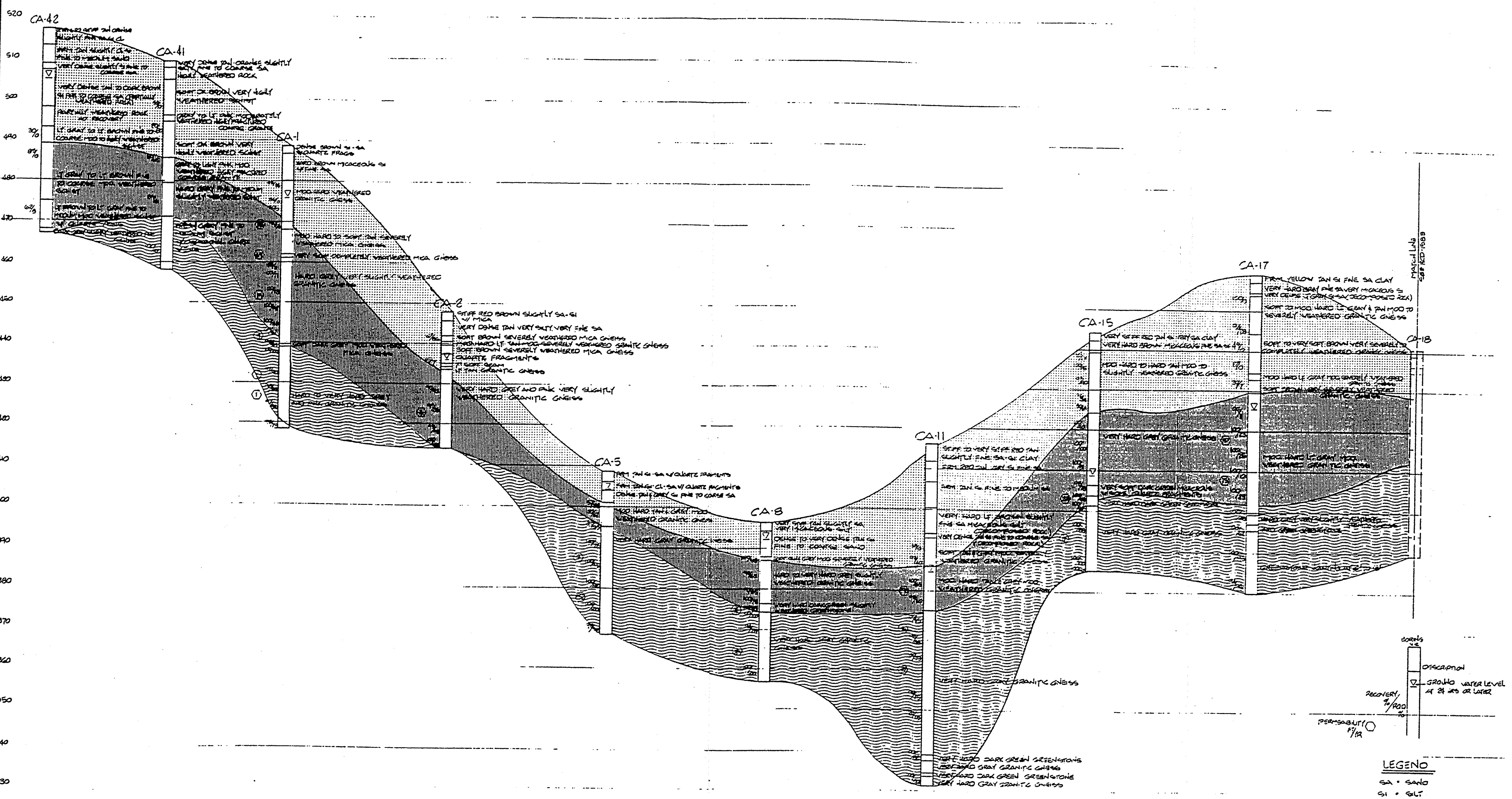
FOR COMPLETE LIST OF REFERENCE DRAWINGS, SEE RCD-1...

CAROLINA POWER & LIGHT COMPA...
POWER PLANT CONSTRUCTION DEPT. RALEIGH

MAYO ELECTRIC GENERATING PLANT
ASH POND DAM - BORING PLAN

EXHIBIT 25

SCALE 1"-400'	APPROVED K B Wilson	DATE 4/2
UNIT C.E.		
DR EDS/CH		RCD-1



SCALES

HORIZONTAL 1" = 50'

VERTICAL 1" = 10'

LEGEND

SA = SAND

SI = SILT

CL = CLAY

FOR COMPLETE LIST OF REFERENCE DRAWINGS, SEE RCD-1580

EXHIBIT 26

CAROLINA POWER & LIGHT COMPANY

FOSSIL POWER PLANT ENGINEERING DEPT.-RALEIGH, N.C.

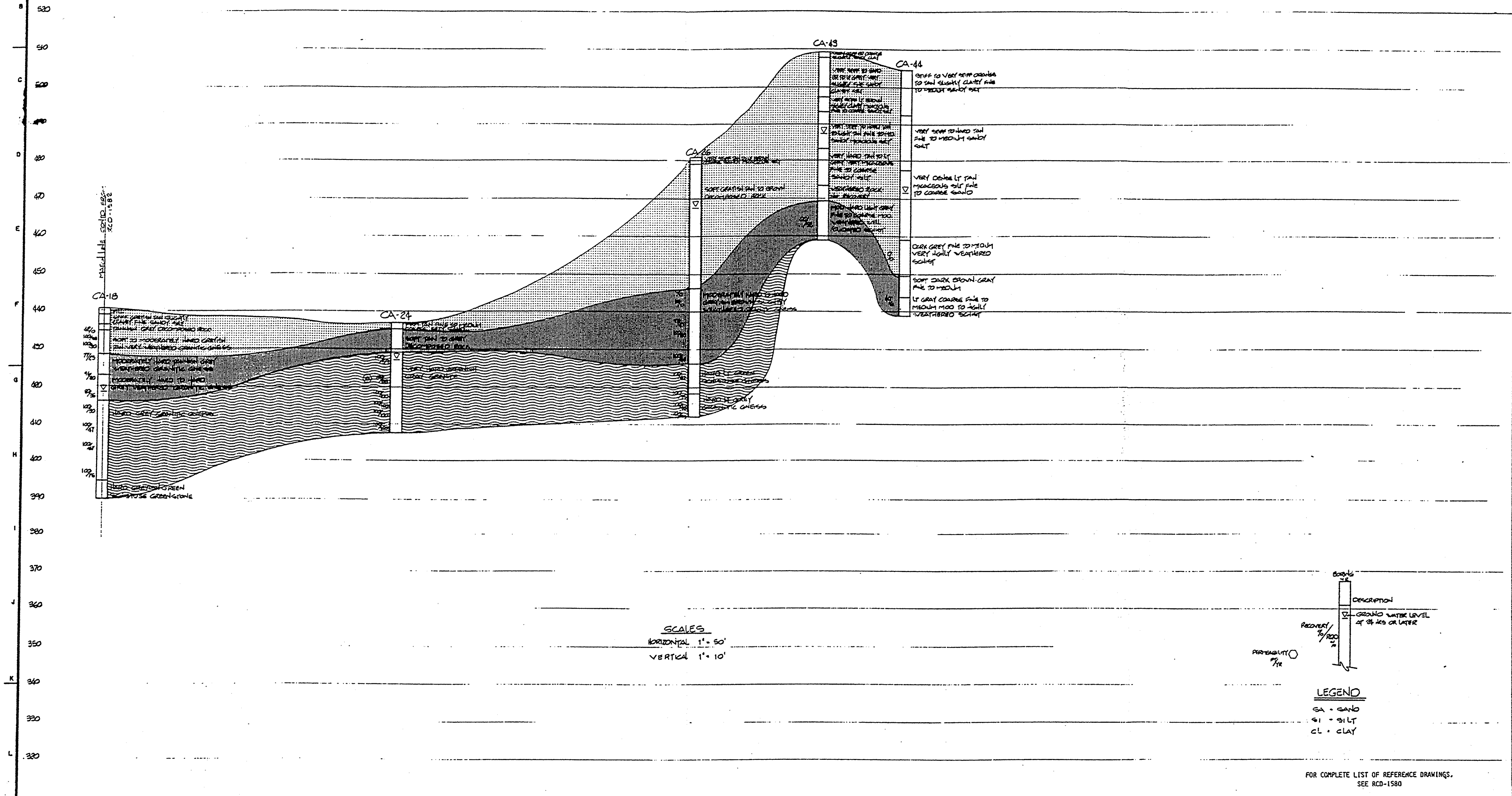
MAYO E. G. P. ASH POND DAM

GEOLOGIC PROFILE

NO.	DATE	REVISION
1	2-10-83	AS BUILT
0	3-22-80	ISSUED FOR CONSTRUCTION

DATE 3-22-80

DWG. NO. RCD-1582



FOR COMPLETE LIST OF REFERENCE DRAWINGS, SEE RCD-1580

EXHIBIT 27

CAROLINA POWER & LIGHT COMPANY
FOSSIL POWER PLANT ENGINEERING DEPT.-RALEIGH, N.C.

MAYO E. G. P. - ASH POND DAM
GEOLOGIC PROFILE

NO.	DATE	REVISION
1	2-18-83	AS-BUILT
0	9-22-80	ISSUED FOR CONSTRUCTION

DWG. NO. RCD-1583

TABLE 4
BORROW SOIL SUMMARY
CRUTCHFIELD BRANCH BORROW AREA
MAYO ELECTRIC GENERATING PLANT
CAROLINA POWER & LIGHT COMPANY
PERSON COUNTY, NORTH CAROLINA
OUR PROJECT NO. RA-802

STRATUM DESIGNATION AND WHERE FOUND	GENERAL DESCRIPTION	THICKNESS			Estimated Yardage In Place	Grain Size Characteristics						Natural Moisture Content %			ATTERBERG LIMITS			COMPACTION CHARACTERISTICS RANGE			
						% - 200			% Clay						LL/PI			Standard Proctor		Modified Proctor	
		Max	Min	Avg.		Max	Min	Avg.	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg.	γ_d max pcf	w_{opt} %	γ_d max pcf	w_{opt} %
STRATUM A On Hilltops; may be absent on hillsides	Red to Reddish-Brown Slightly Sandy Silty Clay - Unified Classification MH-CH. Lower Part is less plastic; Unified Classification ML - CL	25	5	15	550,000	76	65	72	40	17	25	30	21	25	60/27	40/12	50/22	95 - 104	17.7 - 23	107 - 117	12.3-17.5
STRATUM B Underlies Stratum A on hilltops; at ground surface on hillsides	Tan to Greenish-Tan Fine Sandy Silt - Unified Classification ML - CL Lower part grades into less plastic, more silty soil; Unified Classification ML.	25	5	10	1,100,000	73	64	66	17	11	13	28	13	19	51/17	30/6	38/11	103.8-107	16.6-17.7	112 - 125	11.4-14.[illegible]

EXHIBIT 28
Page 1 of 2

TABLE 5

DESIGN PROPERTY RANGE AND RECOMMENDATION

CRUTCHFIELD BRANCH BORROW AREA

MAYO ELECTRIC GENERATING PLANT

CAROLINA POWER & LIGHT COMPANY

PERSON COUNTY, NORTH CAROLINA

OUR PROJECT NO. RA-802

RANGE OF PROPERTIES USED IN DESIGN ANALYSIS

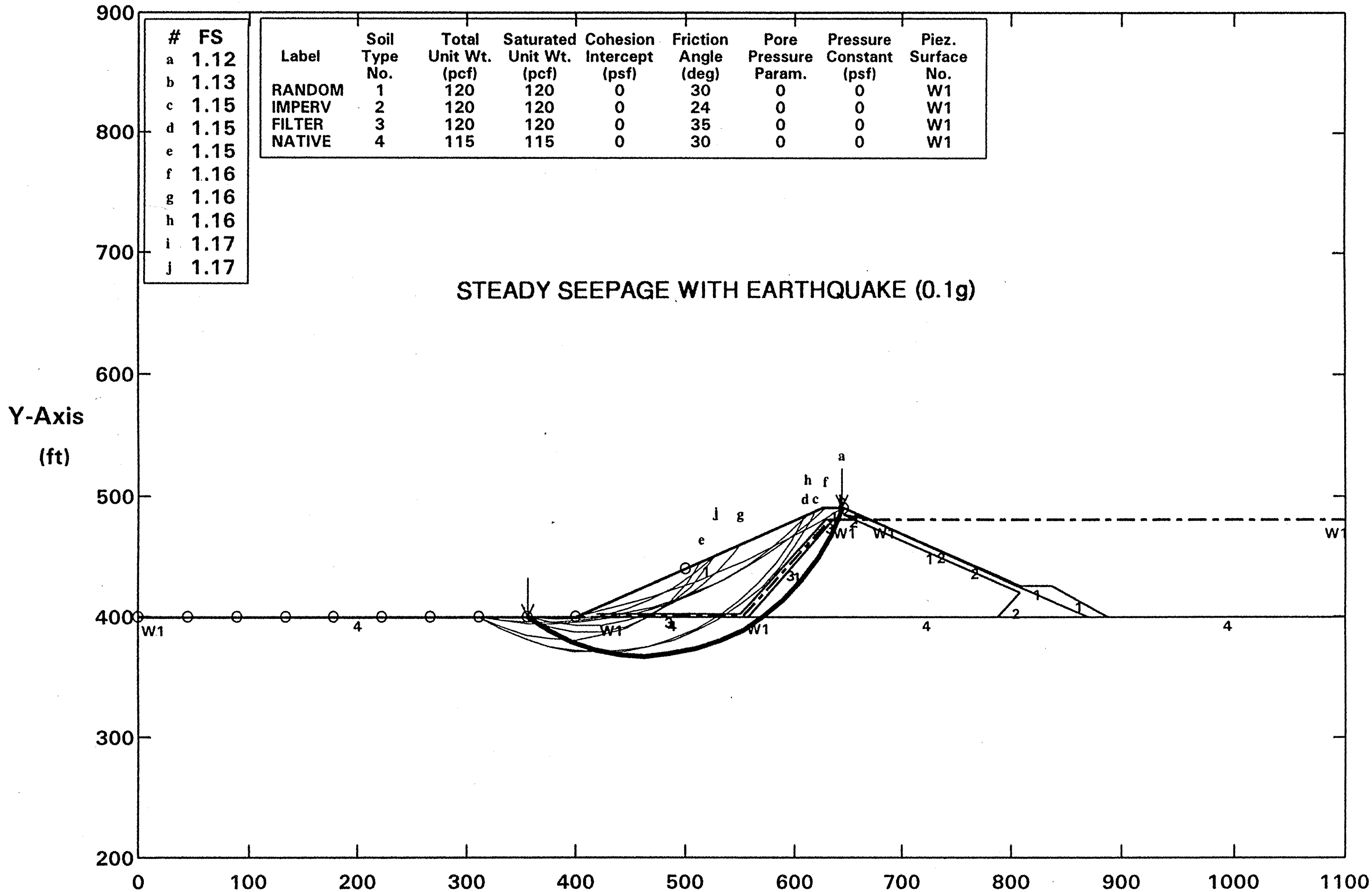
STRATUM	PERMEABILITY k, cm/sec	GRADATION		STRENGTH FOR REMOLDED SAMPLES (MODIFIED PROCTOR)						REMARKS
				UU		CU (total)		CU (effective)		
		D_{15}, mm	D_{85}, mm	ø	c, ksf	ø	c, ksf	ø'	c', ksf	
A	3×10^{-8} - 8×10^{-8}	<.001-.0015	.2 - .3	17 - 17.5°	3.3 - 4.8	12 - 21°	0 - 1.6	22.5-26.5°	.2 - 1.0	Samples remolded to 95% Modified Proctor maximum dry density at moisture content 2 percentage points above the optimum.
B	2×10^{-7} - 10^{-9}	.0018-.003	.25 - .45	21 - 27.5°	1.75 - 2.0	19 - 22°	.3 - .9	22.5-25°	.8 - 1.2	Samples remolded to 95% Modified Proctor maximum dry density at moisture content 2 percentage points above the optimum.

RECOMMENDED PROPERTIES FOR USE IN DESIGN ANALYSIS

STRATUM	PERMEABILITY	GRADATION		STRENGTH FOR COMPACTED SOIL (MODIFIED PROCTOR)						REMARKS
				UU		CU (total)		CU (effective)		
		D_{15}, mm	D_{85}, mm	ø	c, ksf	ø	c, ksf	ø'	c', ksf	
A	10^{-8}	.001	.25	15°	3.0	15°	.3	20°	.2	
B	10^{-8}	.0025	.35	20°	1.6	18°	.4	22°	.3	

CP&L MAYO PLANT ASH POND DAM

Ten Most Critical. H:3524.PLT By: ADB 09-08-99 4:15pm



STABL6H FSmin = 1.12 X-Axis (ft)

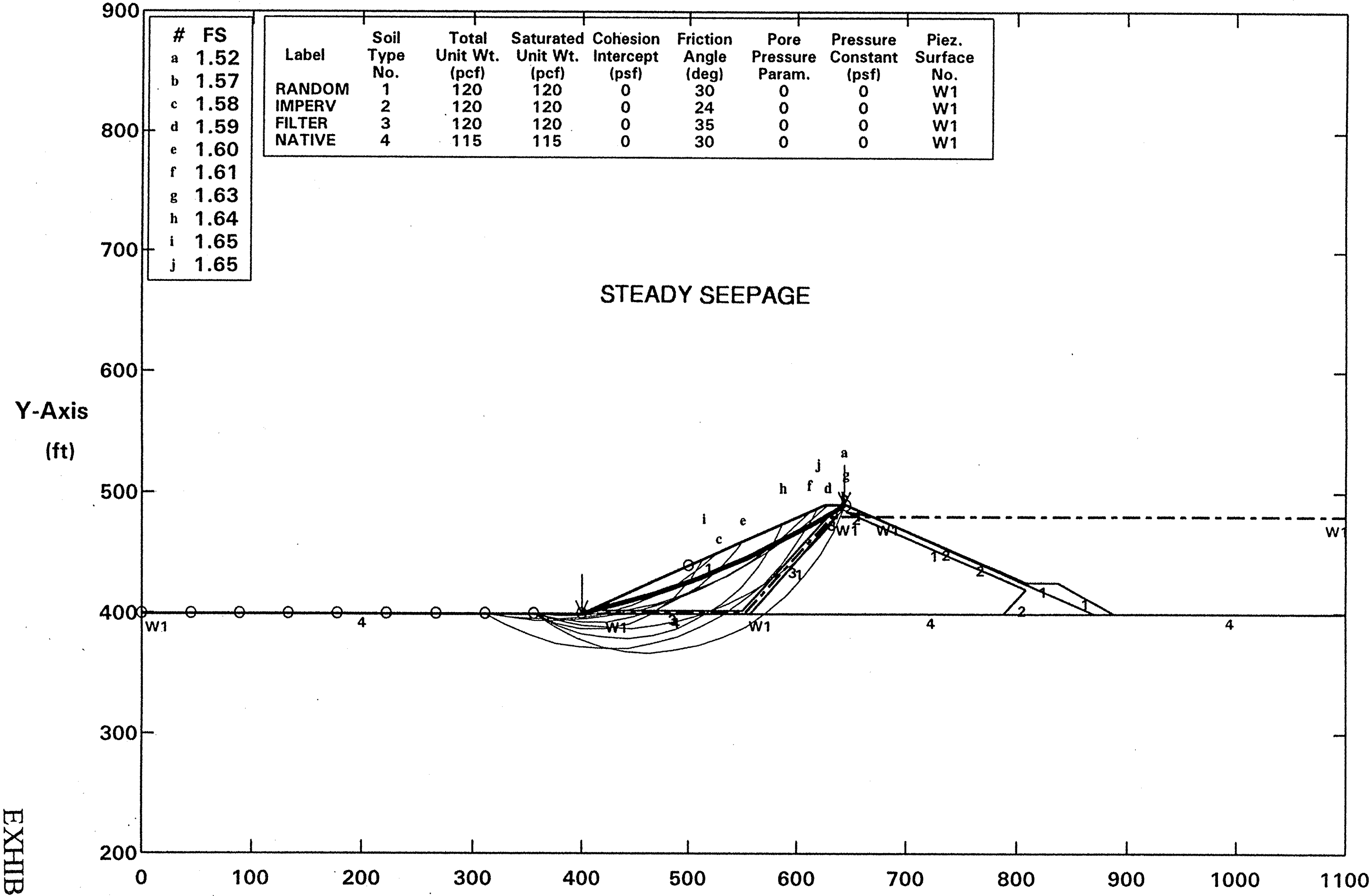
Factors Of Safety Calculated By The Modified Bishop Method

CP&L MAYO PLANT ASH POND DAM

Ten Most Critical. H:3524.PLT By: ADB 09-08-99 4:21pm

#	FS
a	1.52
b	1.57
c	1.58
d	1.59
e	1.60
f	1.61
g	1.63
h	1.64
i	1.65
j	1.65

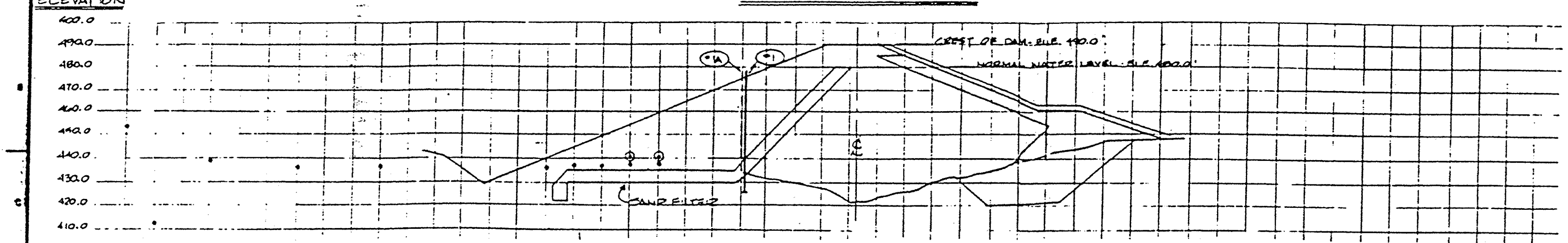
Label	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
RANDOM	1	120	120	0	30	0	0	W1
IMPERV	2	120	120	0	24	0	0	W1
FILTER	3	120	120	0	35	0	0	W1
NATIVE	4	115	115	0	30	0	0	W1



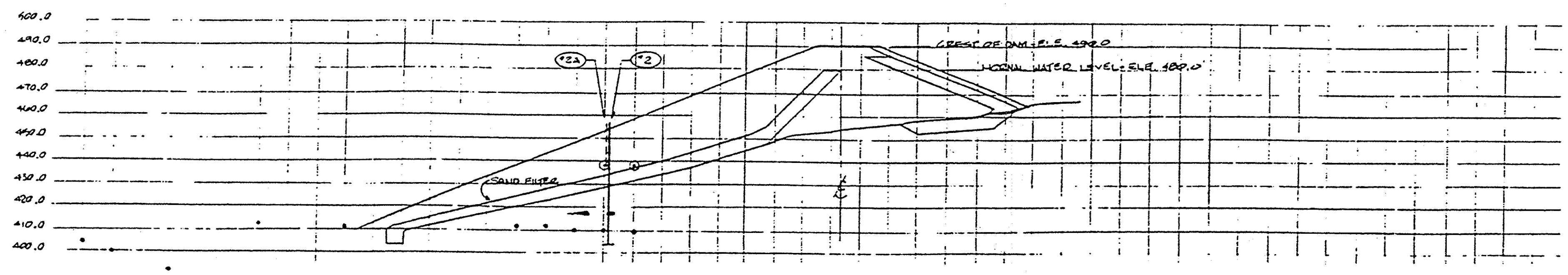
STABL6H FSmin = 1.52 X-Axis (ft)

Factors Of Safety Calculated By The Modified Bishop Method

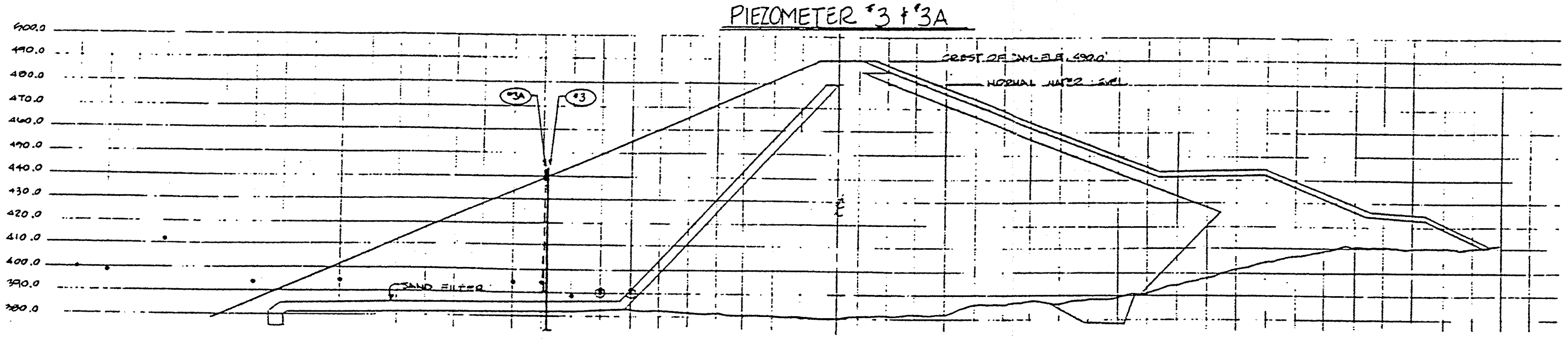
PIEZOMETER #1 & #1A



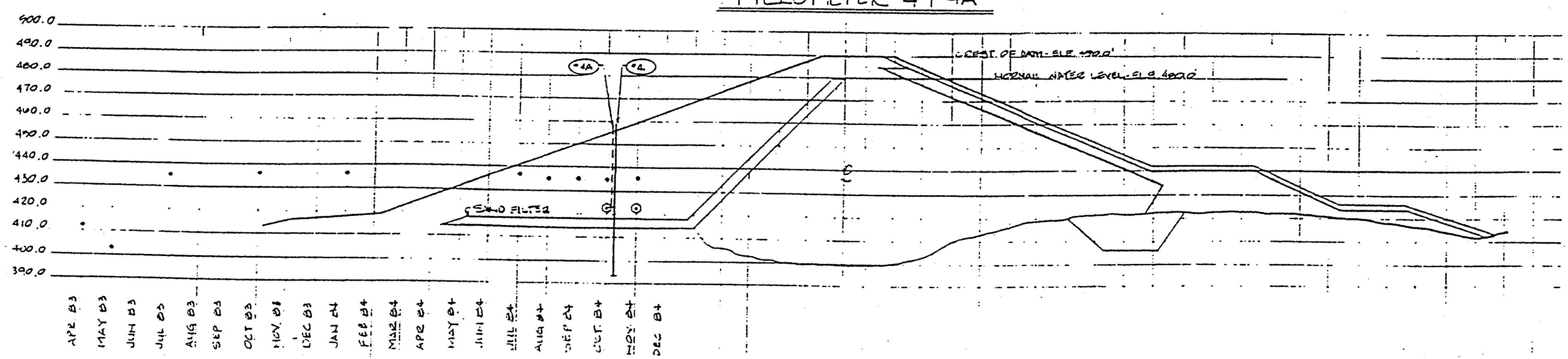
PIEZOMETER #2 & #2A



PIEZOMETER #3 & #3A



PIEZOMETER #4 & #4A



PIEZOMETER No.	1	1A	2	2A	3	3A	4	4A
TOP OF PIPE	477.03'	476.11'	449.74'	469.66'	448.15'	447.15'	445.82'	455.42'
TIP OF PIEZOMETER	425.03'	440.0'	405.74'	439.0	373.15'	391.0	393.82'	424
HORIZONTAL OFFSET	50'	50'	100'	100	125'	125	100'	100
STATION	14+00	13+90	19+50	19+40	26+00	25+90	28+00	27+90
TOP OF SANDFILTER	436.45'	436.55'	434.00'	434.50'	389.00'	389.00'	417.82'	417.82

NOTES:

1) PIEZOMETERS 1A, 2A, 3A AND 4A WERE INSTALLED IN THE RANDOM FILL EMBANKMENT IN SEPTEMBER 1984. THEY ARE EXPECTED TO BE DRY WHEN SAND FILTER AND THE DRAIN ARE FUNCTIONING PROPERLY.

LEGEND

- • PIEZOMETERS 1, 2, 3, & 4 WATER LEVEL READING
- ⊙ PIEZOMETERS 1A, 2A, 3A & 4A DRY READING
- ● PIEZOMETERS 1A, 2A, 3A & 4A WATER LEVEL READING

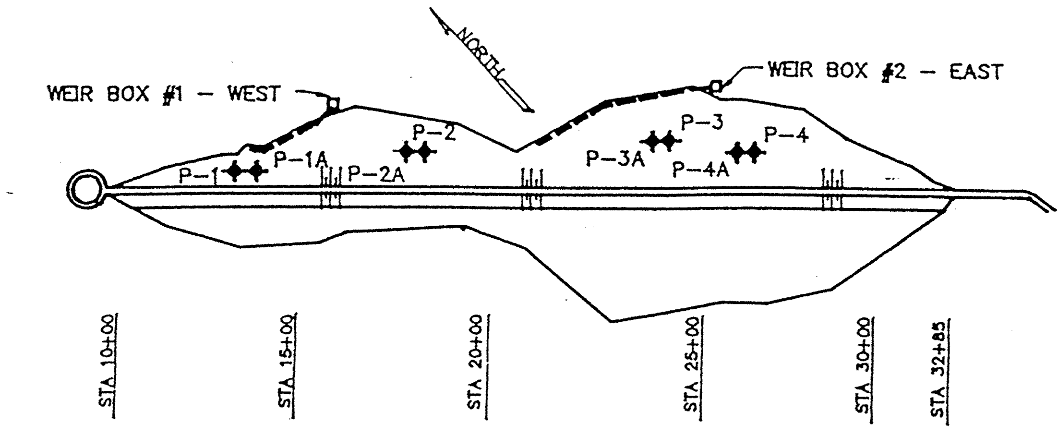
EXHIBIT 30

CAROLINA POWER & LIGHT COMPANY
FOSSIL ENGINEERING & CONSTRUCTION DEPT.

MAYO EGP ASH POND DAM
PIEZOMETER DATA

SCALE NTS	APPROVED	DATE 10-23-84
UNIT/SECTION CIVIL		DWG. NO. D-6137
DR. BAKER		
CH.		

NO.	DATE	REVISION	BY	CH	APPROVED

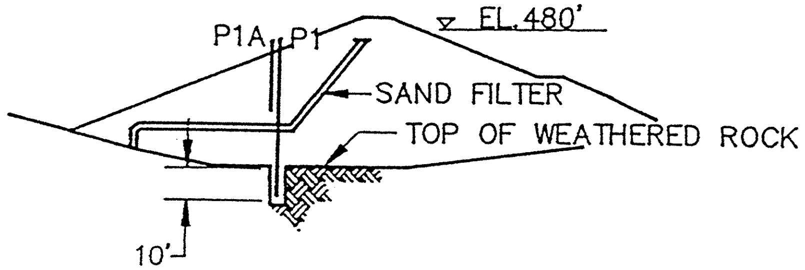


PLAN VIEW OF ASH POND DAM

N.T.S.

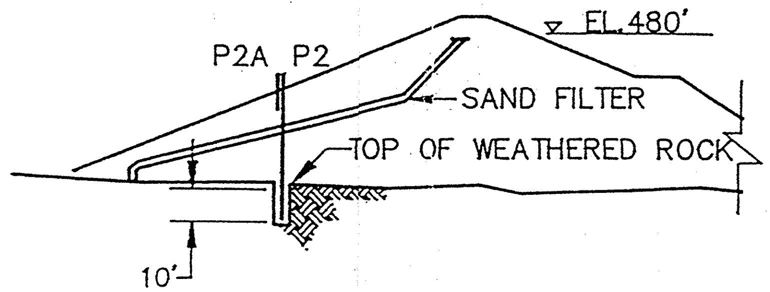
ASH POND DAM

PIEZOMETER SCHEDULE			
PIEZ. #	STATION	HORZ. OFFSET	T.O.P.
1	14+00	50'	477.73'
1A	13+90	50'	476.28'
2	19+50	100'	459.90'
2A	19+40	100'	459.86'
3	26+00	125'	448.24'
3A	25+90	125'	447.20'
4	28+00	100'	455.94'
4A	27+90	100'	456.22'



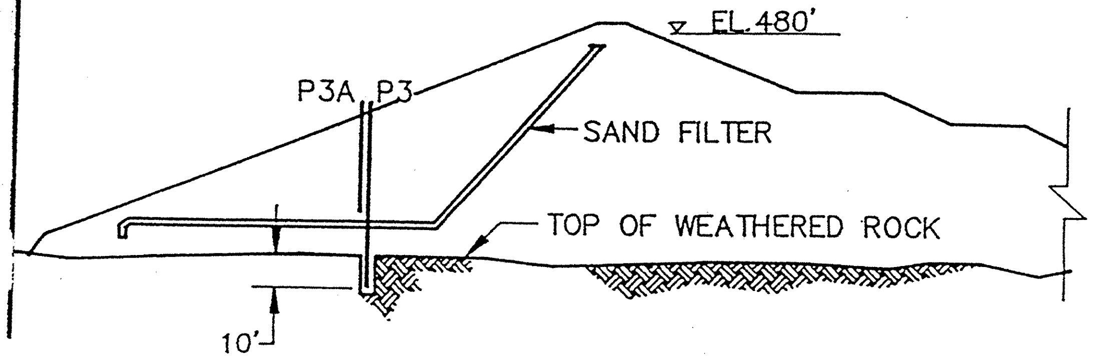
CROSS SECTION @ P1 & P1A

N.T.S.



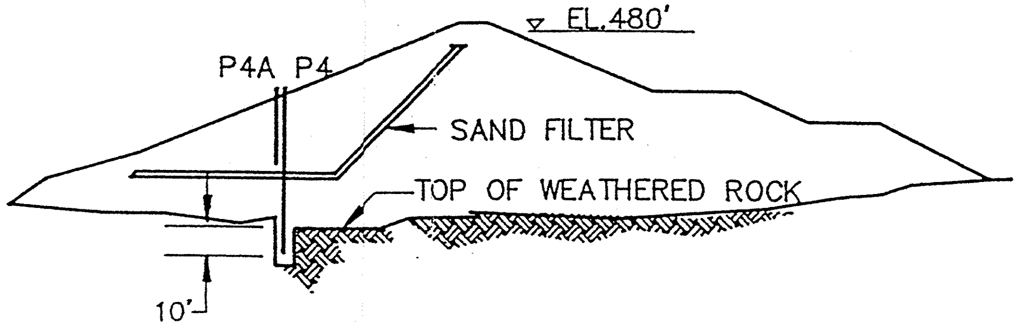
CROSS SECTION @ P2 & P2A

N.T.S.



CROSS SECTION @ P3 & P3A

N.T.S.



CROSS SECTION @ P4 & P4A

N.T.S.

NOTES:

1. FREQUENCY OF READINGS SHALL BE AS SPECIFIED ON DRAWING D-3691, DAM MONITORING ACTIVITIES.
2. READING AND RECORDING OF THE PIEZOMETERS SHALL BE AS SPECIFIED IN THE MAYO EGP DAM MONITORING PROCEDURE MANUAL.
3. ASH POND NORMAL WATER LEVEL EL. 480.0'
4. PIEZOMETERS 1A, 2A, 3A & 4A WERE INSTALLED IN THE RANDOM FILL EMBANKMENT 5' ABOVE THE SAND FILTERS. THEY ARE EXPECTED TO BE DRY WHEN THE FILTER AND TOE DRAIN ARE FUNCTIONING PROPERLY.
5. MONITORING DATA DESIGNATED AS "DRY" WILL BE PLOTTED AS THE FOLLOWING NUMERICAL VALUE:

1A	DRY @ EL. 439.7
2A	DRY @ EL. 441.9
3A	DRY @ EL. 395.8
4A	DRY @ EL. 420.1

6. CONCRETE WEIR BOXES #1 & #2 WERE INSTALLED IN THE SUMMER OF 1984. THE WEIR BOXES CONTAIN 90° V-NOTCH WEIRS.

EXHIBIT 31

CAROLINA POWER & LIGHT COMPANY
FOSSIL PLANT BETTERMENT DEPT.

MAYO ELECTRIC GENERATING PLANT
5 YEAR DAM SAFETY INSPECTION – 1989
ASH POND DAM – PIEZOMETERS

SCALE N.T.S.
APPROVED
UNIT/ CIVIL SECTION FPES
DR. B.A. HARRIS
CH. S.B. MACQUEEN

/usr2/civil/mayo/mon/exhibit32

Document title

Mayo Steam Plant Ash Pond and Reservoir Dams Emergency Notification

Document number

EMG-MAYC-00002

Applies to: Mayo Fossil Plant - Carolinas

Keywords: emergency; mayo fossil plant – emergency; dikes

Legend:
OPS Operations
ENG Engineering
WMT Work Management
TRG Training
ENV Environmental
FIN Financial
CBT Combustion Turbine
ADM Administrative

Organizational Applicability							
OPS	**ENG**	**WMT**	**TRG**	**ENV**	**FIN**	**CBT**	**ADM**
X				X			X

1.0 PURPOSE

1.1 To establish effective and consistent notification of dam emergency conditions.

1.2 Dam safety issues at the Mayo Steam Plant fall under the regulatory jurisdiction of the North Carolina Utilities Commission (NCUC). This procedure specifies how Mayo Steam Plant handles dam/dike emergency notifications.

2.0 TERMS AND DEFINITIONS

2.1 None

3.0 RESPONSIBILITIES

3.1 The shift supervisor or his/her designee has the primary responsibility for classifying the emergency condition, completing the Emergency Response Information Sheet, (Attachment EMG-MAYC-00002-4), and for immediate notification of county and other local emergency response agencies listed in Attachment EMG-MAYC-00002-2, Dam Emergency Notification Log Sheet – Mayo Steam Plant. (If any residential, commercial, or industrial developments or other downstream parties will be affected, then they should be added to the notification list on Attachment EMG-MAYC-00002-2).

3.2 The Person County, NC and Halifax County, VA Emergency Management will have the primary responsibility for coordinating public warnings, evacuation, emergency response, and disaster relief efforts.

3.3 The State emergency preparedness organizations will be notified to provide support as needed for the local emergency response efforts.

3.4 The Utilities Commission for North Carolina will be notified of the emergency by Field Engineering – Discipline and Site Support.

3.5 Progress Energy's Communications and Community Relations will be advised of the emergency and will coordinate all media contacts and news releases.

7.3.2 The notification checklist in Attachment EMG-MAYC-00002-3, Dam Emergency Notification Checklist, should be used as a reference. The communicator can fill in the appropriate information to describe the emergency condition and use the notification checklist for reference in completing the notification calls.

7.3.3 The log sheet portion of Attachment EMG-MAYC-00002-2, Dam Emergency Notification Log Sheet – Mayo Steam Plant, should be used for organizing the calls and recording the results. This log sheet can also serve as a listing of calls by order of priority. The plant manager or his designee should be called when this has been completed.

7.4 Annual Review

7.4.1 All telephone numbers and contacts listed on the notification log should be checked by the Operations Shift Supervisor on an annual basis to verify that no changes have occurred. The notification log must then be appropriately revised as required. The plant will submit to the Vice President – Fossil Generation Department, a copy of current notification log for each plant by July 1 of each year. The Vice President – Fossil Generation Department will then route a copy to the Environmental Services Section of the Technical Services Department.

8.0 RETURN TO NORMAL

8.1 None

9.0 DOCUMENTATION

9.1 None

10.0 REFERENCES

10.1 None

11.0 ATTACHMENTS/FORMS

11.1 Attachment EMG-MAYC-00002-1 – Data Sheet for Dam Emergency Notification (Ash Pond) – Page 1 of 2

11.2 Attachment EMG-MAYC-00002-1 – Data Sheet for Dam Emergency Notification (Mayo Reservoir) Page 2 of 2

11.3 Attachment EMG-MAYC-00002-2 – Dam Emergency Notification Log Sheet – Mayo Steam Plant

11.4 Attachment EMG-MAYC-00002-3 – Dam Emergency Notification Checklist

11.5 Attachment EMG-MAYC-00002-4 – Emergency Response Information Sheet Fossil Generation Department

Data Sheet for Dam Emergency Notification

(For Each Dam/Impoundment)

A. Plant Name: MAYO STEAM PLANT

B. Plant Location:

1. County: Person
2. Nearest Town: Roxboro, NC
3. Distance to Nearest Town: 12 (Miles)
4. Fire/Emergency Address: 10660 Boston Road, Roxboro, NC - Telephone 911

C. Dam Description

1. Name: Main Reservoir
2. Function:

a. ____ Cooling Reservoir
b. ____ Ash Storage ___ Active ____ Inactive
c. X Other

D. Size
1. Maximum Structural Height 100 (Feet)
2. Maximum Storage Capacity 142,828 * (AC-FT)
3. Size Classification:
a. ____ Small
b. ____ Intermediate
c. X Large

E. Hazard Potential
1. ____ Low
2. X Significant
3. ____ High

F. Flooding Potential

Names of rivers and streams located downstream that could potentially be affected by flooding from dam failure: Mayo Creek, Hyco Creek, and Dan River.

* At top of dam

Revised: 04/17/09 HML-800400

Continued - Dam Emergency Notification Log Sheet - Mayo Steam Plant

Notification Priority No.	Notification Contact Description	Phone No.	Completed Calls: Date	Completed Calls: Time	Completed Calls: Contact Person	Comments
8.	Legal Department Frank Schiller	Office: (919) 546-5362 Home: (919) 821-5174 Cell: (919) 412-8244				Support for damage claims and insurance matters
9.	Customer Support Department Robert Kinney	Office: (919) 546-7549 Home: (910) 469-3229 Cell: (919) 810-3630				Support for damage claims and insurance matters
10.	Corporate Management Charlie Gates or Brenda Brickhouse	Office: (919) 546-5454 Home: (919) 881-9772 or Cell: (919) 219-1843 Office: (919) 546-4803 (NC) Office: (727) 820-5153 (FL) Home: (727) 896-7242 or Cell: (727) 409-4399				**Contact only if cannot reach anyone from Mayo Plant (Priority 4 above).** **REQUEST** them to direct appropriate resources to respond.
11.	North Carolina Division of Emergency Management	(800) 858-0368 or (919) 733-3942				**Contact only if cannot reach anyone from Environmental Services Section (Priority 7 above).** **REQUEST** them to disseminate notices and messages to the appropriate emergency response and law enforcement organizations throughout North Carolina.
12.	NC Department of Environment and Natural Resources Division of Water Quality Raleigh Regional Office	(919) 791-4200				**Contact only if cannot reach anyone from Environmental Services Section (Priority 7 above).** **REQUEST** them to assist local agencies.
13.	North Carolina Utilities Commission Roy Ericson (Public Utility Industry Analyst) And North Carolina Utilities Commission Public Staff (Executive Director)	(919) 733-3979 Office: (919) 733-0849 Home: (919) 661-7173 (919) 733-2435				**Contact only if cannot reach anyone from Field Engineering – Discipline & Site Support (Priority 6 above).** **REQUEST** them to assist local agencies.

Frequency of Update:		Date/Time:	

Emergency Response Information Sheet

Fossil Generation Department

Location of incident:	Mayo Steam Plant
Date and time of incident:	
Weather conditions at time of incident:	
Were there any CP&L employee injuries or fatalities?	
Were there any contract employee injuries or fatalities?	
Current weather conditions?	
What is the current status of the Plant? **(Please select from the following options)**	
( ) On Line Full Power	( ) On Line Reduced Power Level
( ) Off-Line Not In Demand	( ) Off-Line Forced Outage
( ) Status Unknown	( ) Off-Line But Returned to Service
Were there any environmental problems associated with the incident?	
Is there a need to notify local residents of any potential dangers or hazards?	
Were there any major equipment damages? **(Please select all applicable)**	
( ) Turbine ( ) Boiler	( ) Coal Delivery
( ) Control Room ( ) Cooling Lake Dam	( ) Other
Personnel needed for repairs and recovery:	
Availability of support personnel:	
Projected return to service date (if applicable):	
Projected costs for restoration:	
Brief description of incident:	
Current System Load ___________MW	Current Generation Capacity ____________ MW (With/Without Purchases)

MAY^ ^OWER STATION - Roxboro, NC

1982Pond

INFORMATION REQUEST	RESPONSE
1. Relative to the National Inventory of Dams criteria for High, Significant, Low, or Less-than-Low, please provide the potential hazard rating for each management unit and indicate who established the rating, what the basis of the rating is, and what federal or state agency regulates the unit(s). If the unit(s) does not have a rating, please note that fact.	Hazard Classification – Significant. A professional engineering firm established the rating based on USCOE guidelines and NCDENR Regulations. The unit is under the purview of the North Carolina Utilities Commission.
2. What year was each management unit commissioned and expanded?	Commissioned 1982. Original design not expanded.
3. What materials are temporarily or permanently contained in the unit? Use the following categories to respond to this question: (1) fly ash; (2) bottom ash; (3) boiler slag; (4) flue gas emission control residuals; (5) other. If the management unit contains more than one type of material, please identify all that apply. Also, if you identify "other," please specify the other types of materials that are temporarily or permanently contained in the unit(s).	The unit contains fly ash, bottom ash, boiler slag. Other- categorical low volume wastewater, coal pile runoff, ash sluice water/cooling tower blowdown, and storm water. Flue gas emmission control residuals will be introduced to lower area of pond in 2009.
4. Was the management unit(s) designed by a Professional Engineer? Is or was the construction of the waste management unit(s) under the supervision of a Professional Engineer? Is inspection and monitoring of the safety of the waste management unit(s) under the supervision of a Professional Engineer?	The unit was designed by a professional engineer. The construction was under the supervision of a professional engineer. Some inspections are under the supervision of a professional engineer, some are not. See response to item 5. below.

INFORMATION REQUEST	RESPONSE
5. When did the company last assess or evaluate the safety (i.e., structural integrity) of the management unit(s)? Briefly describe the credentials of those conducting the structural integrity assessments/evaluations. Identify actions taken or planned by facility personnel as a result of these assessments or evaluations. If corrective actions were taken, briefly describe the credentials of those performing the corrective actions, whether they were company employees or contractors. If the company plans an assessment or evaluation in the future, when is it expected to occur?	Semi-annual inspections that include visual inspections and data gathering to detect any problems at an early stage of development are conducted by plant personnel . Attached is a copy of the most recent inspection report available. Actions taken or planned: None taken or planned. Annual inspections are conducted by a third-party professional engineering contractor. The engineering firms that conduct the inspections have expertise in geotechnical and civil engineering. Attached is the most recent annual inspection report. Actions taken or planned: Continue vegetation control program. Two spots at junction with rip rap on downstream slope noted needing filling with No. 78M or No. 57 stone. One active erosion spot at the top of the rock toe on the south section of the Ash Pond Dam should be filled with No. 78 stone. Work Request was written for this work. Comprehensive five-year inspections are conducted by a third-party professional engineering contractor. The engineering firms that conduct the inspections have expertise in geotechnical and civil engineering Attached is the most recent comprehensive inspection dated 2004. Actions taken or planned: Annual vegetation spraying and cutting. Older erosion areas should continue to be observed.

INFORMATION REQUEST	RESPONSE
6. When did a State or a Federal regulatory official last inspect or evaluate the safety (structural integrity) of the management unit(s)? If you are aware of a planned state or federal inspection or evaluation in the future, when is it expected to occur? Please identify the Federal or State regulatory agency or department which conducted or is planning the inspection or evaluation. Please provide a copy of the most recent official inspection report or evaluation.	The North Carolina Utilities Commission requires a five year inspection report. We are not aware of any recent or upcoming inspections by state or federal officials. Refer to the five year report submitted in response to item 5 above for the most recent official report.
7. Have assessments or evaluations, or inspections conducted by State or Federal regulatory officials conducted within the past year uncovered a safety issue(s) with the management unit(s), and, if so, describe the actions that have been or are being taken to deal with the issue or issues. Please provide any documentation that you have for these actions.	There have been no inspections conducted by state or federal official that evaluated the structural integrity other than a visual observation from NPDES inspector. There have been no follow-up actions.
8. What is the surface area (acres) and total storage capacity of each of the management units? What is the volume of materials currently stored in each of the management unit(s). Please provide the date that the volume measurement was taken. Please provide the maximum height of the management unit(s). The basis for determining maximum height is explained later in this Enclosure.	The surface area is approximately 140 acres. The total storage capacity is approximately 4,100 acre-feet. The volume of material currently stored is estimated to be 2,435 acre-feet and was determined in July 2007. The maximum height is 90 feet.
9. Please provide a brief history of known spills or unpermitted releases from the unit within the last ten years, whether or not these were reported to State or federal regulatory agencies. For purposes of this question, please include only releases to surface water or to the land (do not include releases to groundwater).	There have been no known spills or releases

INFORMATION REQUEST	RESPONSE
10. Please identify all current legal owner(s) and operator(s) at the facility.	The facility is owned by Carolina Power& Light Company d/b/a Progress Energy Carolinas, Inc., with a 16.17% ownership by the North Carolina Eastern Municipal Power Agency.

Semi - Annual

MAYO ELECTRIC GENERATING PLANT
DAM AND RESERVOIR INSPECTION WORKSHEET

File: 12520B **Date:** February 12, 2009 **Weather:** Clear
Inspection Conducted By: G. Smith **Rainfall:** 1.2"

A. MAIN DAM AND RESERVOIR AIR TEMPERATURE Avg. 59°F LAKE ELEVATION 434.10

1. Crest, toe, and downstream slope protection for evidence of settlement or slumping:

2. Downstream for erosion, leakage, and drainage:

3. Upstream for wave action erosion:

4. Normal spillway, concrete structures, and concrete drainage ditches adjacent to spillway wing walls:

5. Crack in main spillway:

6. Emergency Spillway:

7. Main Dam:

Flow @ Weir (Outlet Structure): Staff Gage Reading (H) = 0.31 ft.
Flow (Q=2.47H 5/2) = 0.1322 ft^3/sec.

B. ASH POND DAM AND RESERVOIR

1. Crest, toe, and downstream slope protection for evidence of settlement or slumping:

2. Downstream for erosion, leakage, and drainage:

3. Downstream drainage ditch below shotrock:

4. Upstream for wave action erosion:

5. Spillway and skimmer structure:

Flow @ weirs: (a) Box #1 (West) Staff Gage Reading (H) = ** ft.
Flow (Q=2.47H 5/2) = 0.0105 ft^3/sec.
(b) Box #2 (East) Staff Gage Reading (H) = ** ft.
Flow (Q=2.47H 5/2) = 0.0115 ft^3/sec.

C. OTHER INFORMATION

1. Date of last monument survey: ______________________________
2. Comments: Rainfall recorded since 1/29/2009.
* 3. USGS gage reading found on the NPDES Worksheet.
** 4. Ash Pond weir boxes read/measured using graduated cylinder and stop watch.

cc: Manager, Mayo Electric Generating Plant

HMT/hml

Semi - Annual

MAYO ELECTRIC GENERATING PLANT

PIEZOMETER DATA COLLECTION WORKSHEET

DATE: 01/03/09 WEATHER: Clear

DATA COLLECTION BY Ollie Jones & L. D. Martin

A. MAIN DAM

LAKE ELEV. 434

PIEZOMETER NUMBER	TOP OF PIPE ELEV. (A)	READING ON TAPE (B)	M. S. L. ELEV. (A - B)
1	403.46	46.42	357.04
2	426.33	68.54	357.79
3	445.27	82.33	362.94
4	378.81	32.00	346.81
5 *	403.78	54.00 *	349.78
6	426.38	76.50	349.88
7	371.00	25.00	346.00
8	395.04	45.42	349.62
9	420.60	70.00	350.60
10	444.20	79.00	365.20
11	380.49	33.25	347.24
12	403.21	54.00	349.21
13	427.43	75.92	351.51
14	372.94	26.83	346.11
15	397.47	46.75	350.72
16	420.73	67.50	353.23
17	442.17	75.50	366.67
18	451.76	21.13	430.64

ELEVATIONS & READINGS IN FEET

*5 Add 24" section to get reading at installed 'top of pipe'
PVC pipe section broken
W/o written to repair/replace broken section above grade
Bobbie Phillips

B. ASH POND RESERVOIR

PIEZOMETER NUMBER	TOP OF PIPE ELEV. (A)	READING ON TAPE (B)	M. S. L. ELEV. (A - B)
1	537.00		
2	524.76		
3	536.35		
4	527.12		
5	534.58		
6	527.86		
7	527.27		
8	526.93		
9	410.29		

ELEVATIONS & READINGS IN FEET

C. ASH POND DAM

PIEZOMETER NUMBER	TOP OF PIPE ELEV. (A)	READING ON TAPE (B)	M. S. L. ELEV. (A - B)
1	477.73	34.42	443.31
1A (DRY)	476.28	36.92	439.36
2	459.90	46.63	413.28
2A (DRY)	459.86	18.17	441.69
3	448.24	53.83	394.41
3A (DRY)	446.99	52.92	394.07
4	455.94	36.00	419.94
4A (DRY)	456.22	36.50	419.72

ELEVATIONS & READINGS IN FEET

MAYO ANNUAL

Ash Pond - 03/06/08 MAY

Report Details

Summary	A site visit to conduct a limited field inspection of the Main Dam and Ash Pond Dam at the Mayo Steam Electric Plant was conducted on March 06, 2008 by Mr. Al Tice of MACTEC Engineering and Consulting, Inc. (Mactec) accompanied by Mr. George Banker of Progress Energy. Mr. Tice's report is attached that includes summary of observations during the reconnaissance and provides recommendations for actions, exhibits, photographs and copy of the update dam inspection forms. Overall, the ash pond dam appears to be in good condition, especially the vegetation which has been cut to an acceptable level. This improved the clearity of the abnormalitis which might be in the dike. Ms. Dulcie Phillips, plant environmental coordinator, reported during the site visit that spraying, tree cutting and mowing for vegetation control is progress this year on both dams. Most of the recommendations from the previous inspection reports have been or are being implemented by the plant. The dams and dikes are in satisfactory condition, and no emergency actions by the plant are required for continued safety of the dams.
Assessment	The Component Assessment was performed using the Standard. For this assessment, 'Unacceptable' (red) means problems are likely in less than two years. 'Marginal' (yellow) means problems are likely within two to five years. 'Acceptable' (green) means that problems may occur after five years. The assessment frequency for this component is 3 years.
Recommendation	none
Evaluated Condition	Pending
Report by	Scot Auger (MACTEC)/Richard C W Horton
Date of Report	Thursday, March 06, 2008
Last Edit Date	Thursday, July 17, 2008 at 16:20

Maintenance Management

Equipment Code	MAY-C-7030-PON
Date of Next Report	

Library Specification

Library	Balance of Plant
Type of Detail	Unit
Detail Selection	Mayo Common

Report Organization

Report Type	Individual Assessment of an Equipment Type

Component Configuration

Library	Component Assessment
Category	Balance of Plant
Equipment Type	Ash Pond
Utility Standard System	Not Specified

Report Standard Procedure

Reference Library

Reference Report

Report Classification

Topic Group

Topic

Sub-Topic

MAY - Embankment Structures (03/14/07)

Detail Information

Summary	SLOPE PROTECTION - marginal - Local erosion spots in slope at junction with rip rap on downstream slope generally appear inactive; Two spots noted needing filling with No. 78M or No. 57 stone. Vegetation in rip rap and in rock toe needs trees cut and removed and brush sprayed. Downstream slope above rock toe needs mowing. After clearing, maintain on regular schedule. As a minimum, clear paths for access to piezometers. All other items were found to be in acceptable condition.
Assessment	The Component Assessment was performed using the Standard. For this assessment, 'Unacceptable' (red) means problems are likely in less than two years. 'Marginal' (yellow) means problems are likely within two to five years. 'Acceptable' (green) means that problems may occur after five years. The assessment frequency for this component is 3 years.
Recommendation	The one active erosion spot at the top of the rock toe on the south section of the Ash Pond Dam should be filled with No. 78 stone. Work Request #xxxxxxx was written for this work. Vegetation in rip rap and in rock toe needs trees cut and removed and brush sprayed. Downstream slope above rock toe needs mowing. After clearing, maintain on regular schedule. As a minimum, clear paths for access to piezometers.
Evaluated Condition	Marginal
Report by	Scott Auger (MACTEC)/George Banker
Date of Evaluation	Wednesday, March 14, 2007
Last Updated on	Thursday, March 06, 2008 at 06:16

Component Configuration

(Sub) Component	Embankment Structures
Standard of Assessment	**Red** - Problems likely in < than 2 years. **Yellow** - Problems likely in 2 to 5 years. **Green** - Problems likely in > 5 years.

Condition Evaluation CheckList

Item/Criteria	Condition		Comments
Item: Settlement **Criteria:Red**: New or recent depressions in crest or embankment slope. If located above outlet piping consider as **Emergency Response.** **Yellow**: Uneven surfaces with signs of damage to pavement, gravel roads or vegetation. **Green**: Crest and downstream slope visually smooth and uniform.	Acceptable		No concerns noted for current insection.
Item: Slope Stability **Criteria:Red**: Visible scarps, curved cracks with horizontal or vertical offset, bulging in slope or at downstream toe. **Emergency Response, if not seen previously**. **Yellow**: Surface cracks without horizontal or vertical separation. Indications of irregular ground surface, particularly at base of slope. Leaning trees in area adjacent to base of slope. **Green**: No indications of surface cracks or unusual slope appearance.	Acceptable		No concerns noted for current insection.

Item: Seepage **Criteria:Red**: Zones of active water flow with water emerging at defined points. Accumulation of soil mounds at seepage spots. Bubbling appearance in standing water at toe of dam. Seepage flow contains soil particles. Any of the above are **Emergency Response** conditions. Presence of seepage moisture on downstream slope at levels above the lower 1/3 height of the dam. **Yellow**: Wet soils with no apparent water movement or only slight ooze along toe of slope. Seepage flows slightly cloudy, no bubbling. Seepage zones on slopes confined to lower ¼ of height. Evidence of animal burrows on slopes. **Green**: Minor instances of damp or wet soils in lower ¼ portion of slope or along toe. Seepage, if present, is clear.	Acceptable	G	Due to recent dry weather, only very slight flow seen along junction between natural ground and toe of slope south of weir box 2. Believed to be groundwater or delayed release of rainwater. Area previously observed to have more, but still slight flow.
Item: Drainage Systems **Criteria:Red**: Drain outlets blocked or plugged. Water exiting drains appears muddy **(Emergency Response)**. **Yellow**: Drain outlets partly blocked but still flowing. Seepage weirs flooded or partly blocked. Water exiting drains appears slightly cloudy. **Green**: Drains open and any water flowing appears clear. Seepage weirs unobstructed.	Acceptable	G	Channels leading out from weir boxes need occasional cleaning of sediment. Outlet pipes at weirs have some iron deposits. Clean occasionally.
Item: Slope Protection **Criteria:Red**: Large gullies in slopes with no vegetation. Beaching erosion evident with local slumps of slopes above eroded areas and sparse vegetation on slope at water line. Vegetation sparse to absent on most slopes. Brushy vegetation or trees growing in slope. Fallen trees adjacent to slope toe or on slope with disruptions of slope. **Yellow**: Minor erosion rills or gullies (typically less than 6 inches deep). Localized sparse grass cover. Localized beaching erosion without slope failures above eroded areas. Grass or brush growth in rip rap blankets or over clay liner areas. **Green**: Minimal erosion. Good vegetative cover. Minimal beaching erosion. Minimal vegetative growth in rip rap areas.	Marginal	Y	Localized erosion has been noted at intersection between riprap and soil on downstream slope. Continue to monitor this condition and provide repair as needed. For this inspection, we would like to emphasize the importance of improving the overall control of vegetation for the Ash Pond Dam. Growth of brush and small trees was observed in the riprap on the upstream slope. The downstream slope and toe of the dam are becoming very heavily overgrown. There is also significant growth developing in the riprap at the toe of slope.

MACTEC

June 9, 2004

Mr. Richard Horton
Progress Energy
2610 Wycliff Road, Suite 405
Raleigh, North Carolina 27607-3073

Subject: **INITIAL RECOMMENDATIONS FROM FIELD INSPECTION**
MAIN DAM AND ASH POND DAM
MAYO PLANT, PERSON COUNTY, NORTH CAROLINA
MACTEC PROJECT 6468-04-0590

Dear Mr. Horton:

The field inspection for the 5-Year Independent Consultant Inspection of the Main Dam and Ash Pond Dam at the Mayo Steam Electric Plant was conducted on March 4, 2004 by Mr. Al Tice of MACTEC Engineering and Consulting, Inc. (MACTEC) accompanied by Mr. Richard Horton of Progress Energy. At the plant, we interviewed Mr. Reggie Clay from the Fuel Handling group which is responsible for performing routine maintenance. A brief telephone interview was later conducted with Ms Dulcie Phillips, the plant environmental coordinator.

The inspection included a general discussion of operations and repair activities conducted since the last 5-year inspection in 1999. Instrumentation readings from piezometers and weirs were requested for later review. This letter summarizes our initial comments from the records review and field inspection and presents our initial recommendations. These recommendations were reviewed with Mr. Horton at the end of the field inspection and are provided to assist Progress Energy in addressing concerns prior to the issuance of the final report.

MAINTENANCE ACTIVITIES/RECORDS DISCUSSION

Mr. Clay reported that spraying for vegetation control was done on the Ash Pond last year. Additional spraying is planned for this spring on both dams. No repair or significant maintenance has been needed since the last 5-year inspection.

Piezometers in the Main Dam and Ash Pond Dam are monitored semi-annually by the chemistry lab technicians. The readings are sent to the West Region engineering office in Raleigh where they are entered into a master file. The records were not at the plant. They will be obtained from Mr. Matt Farabaugh of the West Region office and reviewed in preparing the inspection report.

FIELD OBSERVATIONS

Main Dam

The overall condition of the dam and spillway is good. No significant deterioration in the conditions since the previous 5-year inspection in 1999 or the site visit in 2003 was seen. The crest and upstream slope show no unusual settlement and no cracking. Vegetation in the upstream slope riprap is under control. The downstream slope is well vegetated, but is beginning to show need for vegetation control; Mr. Clay indicated spraying is on the schedule for later in the spring.

At the eastern end of the downstream maximum height section, where the natural ground begins to slope upward, there is minor seepage at the base of the dam. The seepage is of low volume and velocity, and it flows down hill along the natural rock surface. This seepage has been seen previously, and it does not represent a concern for dam safety. The area should be observed during routine inspections to see if the flow rate or volume appears to be increasing, or if soil particles are observed.

The area below the rock toe has some standing water that is normal due to the topography. The water is drained under the toe access road to the measurement weir. The weir flow appeared normal. The weir gauge was readable. This weir monitors seepage from the rock toe drain as well as surface runoff between the toe road and the dam.

The rock toe section is relatively clear of vegetation, but there are some small trees that need spraying (as the plant plans to do). Several vertical holes, some of which appear to be groundhog burrows, were noted in the dam face along the top of the rock toe. In some cases, it appeared soil is washing down into the rock toe, although severe erosion was not noted. These areas should be filled with a fine gravel such as No. 78M stone to minimize further erosion. Groundhogs should be removed.

The concrete of the stilling basin was in good condition.

The intake structure, viewed through binoculars, appeared in good condition.

The emergency spillway has tree growth in the control section on the east side that has been recommended to be cut in the past. The cutting has not been done. Mr. Clay noted that it is planned to be done this spring or summer. Subsequent to the field visit, Mr. Tice met with Mr. Clay to show him the extent of the area to be cut.

The main spillway was covered by flowing water and a detailed inspection was not possible. Another visit will be made in the summer, when the spillway is dry, for detailed checks of the joints. Even though the primary spillway had water flowing over it, a general view of the joints was made. The flow pattern was very smooth across the ogee section except for two small spots where concrete scaling has been observed previously. The flow down the spillway slab sections is smooth over most of the joints. Flow disruption was seen at the 18th, 19th and 20th joints from the ogee in areas where slight loss of concrete was seen previously. Further comments on the spillway will be made after the detailed inspection.

Ash Pond Dam

Overall, the ash pond dam appears to be in good condition. No significant deterioration since the 1999 inspection was seen.

The crest shows no indications of unusual settlement or cracking.

The upstream slope is covered with riprap. A fair amount of possibly dead vegetation is present along with several small trees. Mr. Clay indicated the general vegetation is dead from last year's spraying, but that additional spraying is planned for this spring to address the tree growth. The spraying program appears to be adequately controlling the vegetation.

The downstream slope is well grassed. Brier growth in the lower part of the slope is becoming excessive. The riprap on the base of the slope was noted in 2003 as becoming overgrown with briers and small trees. Spraying has been conducted and most of the small trees, while still in place, are dead. Additional spraying is planned by the plant to deep the vegetation under control.

Where the toe rip rap meets the soil slope of the dam, some erosion areas have been formed in the past, and some have been repaired by filling with gravel. Two small areas were noted near the north end of the dam in 2003 and these were still present. Vegetation has grown over the areas, and they appear inactive.

Similar old eroded spots were noted on the southern section of the dam; these also appeared inactive except for one that is about 120 feet south of the north end of the rock toe. This second spot has an exposed soil scarp with wet soils and a slight ooze of water. The water was interpreted as surface seepage from recent rainfall. Similar wet soils were seen along the dike; a hand auger boring found the soils became drier with depth.

All of the erosion areas should be observed at least during the piezometer reading visits for signs of reactivation of erosion. If the conditions show changes, the areas should be filled with No. 78M stone.

Both weir structures are in satisfactory condition, and the flow from them is not blocked by vegetation or sediment. The weir plates have been removed, and flow measurements are taken by graduated cylinder and stopwatch.

Along the junction between the dam and the natural ground to the south of Weir Box No. 2, a slight flow of water and some wet areas were observed, extending 100 feet to the south of the weir. This flow and wet condition was observed in 1999 and in 2003, and it appears similar to the conditions observed at those times. The flow may be partly from natural ground. The flow is clear and very slight.

SUMMARY

Most of the recommendations from the 1999 5-year independent consultant inspection report have been implemented by the plant. The one exception is clearing of trees from the eastern side of the emergency spillway. However, the dams and dikes are in satisfactory condition, and no emergency actions by the plant are required for continued safety of the dams. The following items are recommended for further action, in order of priority:

RECOMMENDED ACTIONS	RECOMMENDED TIME FRAME FOR IMPLEMENTATION
1. Trees growing in the exit part of the east side of the emergency spillway for the Main Dam should be cut back to the point where the natural slope begins to trend downward. A sketch of the area needing clearing is attached.	Within six months
2. The holes at the top of the rock toe of the Main Dam should be filled with No. 78M stone.	Within one year
3. The apparent inactive erosion spots at the top of the riprap on the Ash Pond Dam should be observed during each piezometer reading trip for indications of new activity. If new activity is observed, fill the spots with No. 78M stone.	Every six months
4. The seepage area at the east end of the Main Dam should be observed during piezometer reading trips to see if the flow rate or volume appears to be increasing, or if soil particles are observed.	Every six months
5. Annual spraying and cutting for vegetation control on the rock toe and lower part of the Main Dam and on the riprap on the lower slope of the Ash Pond Dam should continue.	Annually

MACTEC is pleased to continue assisting Progress Energy with inspections of the dams and dikes at the Mayo Plant. Please contact us if you have any questions about this report.

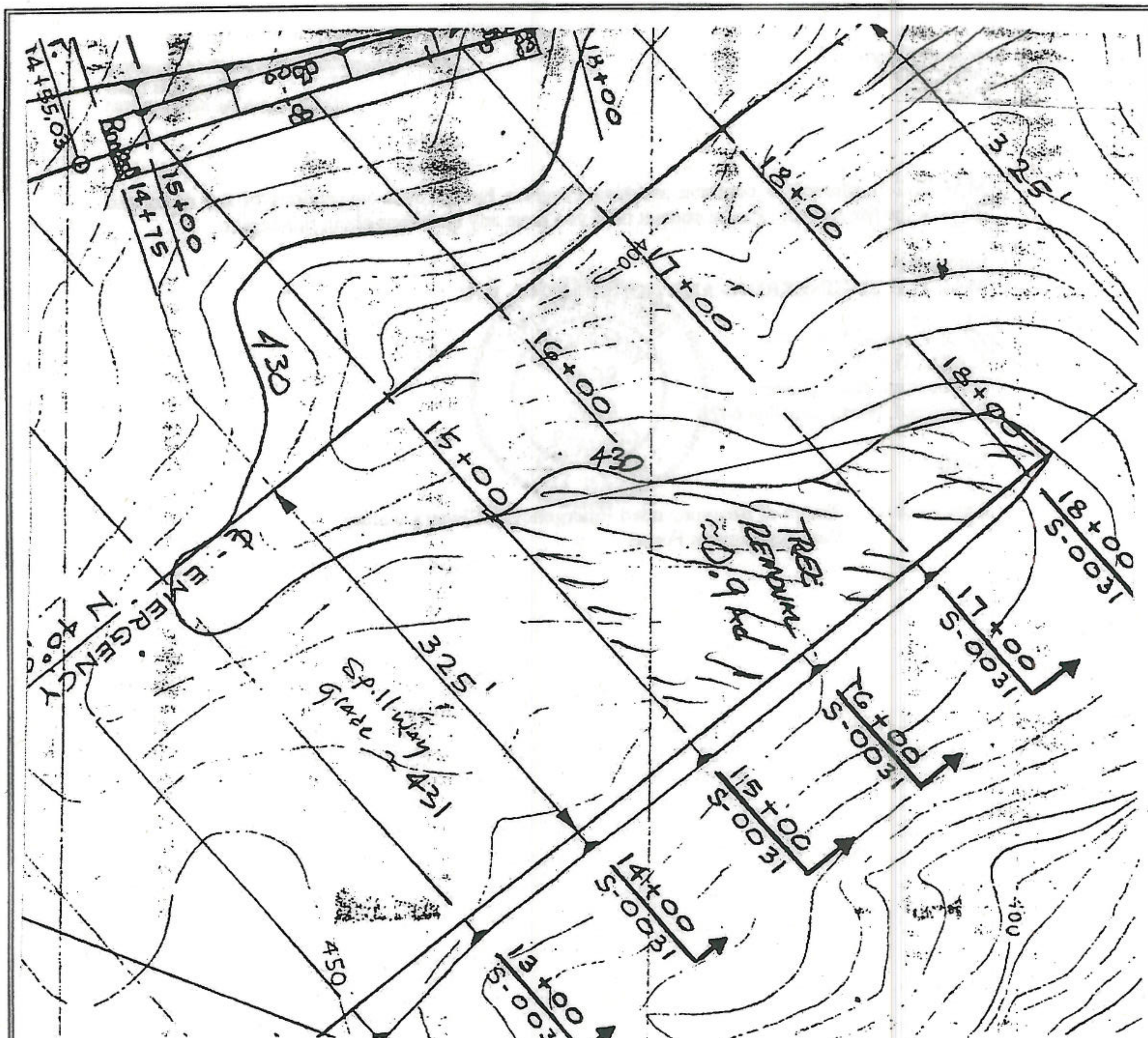
Sincerely,
MACTEC ENGINEERING AND CONSULTING, INC.

J. Allan Tice, P.E.
Senior Principal Engineer
Registered, North Carolina 6428

NORTH CAROLINA
PROFESSIONAL
SEAL
6428
ENGINEER
J. ALLAN TICE

JAT/jat

Attachments: Sketch of Recommended Emergency Spillway Clearing
Dam Assessment Forms



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MACTEC
RALEIGH, NORTH CAROLINA

DRAWN:		DATE:	Jun-04
DFT CHECK:		SCALE:	1" = 100'
ENG CHECK:		JOB:	6468-04-0
APPROVAL:		DWG:	1

APPROXIMATE TREE CLEARING AREA
MAIN DAM EMERGENCY SPILLWAY
MAYO STEAM ELECTRIC PLANT
PERSON COUNTY, NORTH CAROLINA

REFERENCE: Gibbs and Hill Drawing S-0030

FOSSIL GENERATION COOLINC \SH POND DAM ASSESSMENT FORM

Last Re 06/09/04

PLANT & UNIT: Mayo

COOLING POND:

VENDOR: MACTEC Engineering and Consulting, Inc.

OTHER INFORMATION:

Comments: Based on field visit March 4, 2004.

CONCRETE STRUCTURES	RED	YEL	GRN	Date Revised: 06/09/04 Initials: JAT
CONCRETE SURFACES				
STRUCTURAL CRACKING				
MOVEMENT				
JUNCTIONS				
DRAINS				
WATER PASSAGES				NA
SEEPAGE				
JOINTS				
FOUNDATION				
ABUTMENTS				NA

EMBANKEMENT STRUCTURES	RED	YEL	GRN	Date Revised: 06/09/04 Initials: JAT
SETTLEMENT				
SLOPE STABLITY				
SEEPAGE				
DRAINAGE SYSTEM				
SLOPE PROTECTION				

SPILLWAY STRUCTURES	RED	YEL	GRN	Date Revised: 06/09/04 Initials: JAT
CONTOL GATES				NA
UNLINED SPILLWAYS				
APPROACH CHANNEL				
OUTLET CHANNEL				NA
STILLING BASIN				

OUTLET WORKS	RED	YEL	GRN	Date Revised: 06/09/04 Initials: JAT
INTAKE STRUCTURE				
GATES				NA
SLUICES/WATER PASSAGES				
STILLING BASIN				
APPROACH CHANNEL				NA
OUTLET CHANNEL				
DRAWDOWN FACILITIES				NA

SAFETY/PERFORMANCE INSTRUMENTATION	RED	YEL	GRN	Date Revised: 06/09/04 Initials: JAT
HEADWATER/TAILWATER GAGES				NA
ALIGNMENT INSTRUMENTATION				NA
MOVEMENT INSTRUMENTATION				
UPLIFT INSTRUMENTATON				NA
DRAINAGE INSTRUMENTATION				
SEISMIC INSTRUMENTATION				NA

RESERVOIR	RED	YEL	GRN	Date Revised: 06/09/04 Initials: JAT
SHORE LINE				NA
SEDIMENTATION				
HAZARD AREAS				NA
WATERSHED RUNOFF				NA

OPS & MAINT FEATURES	RED	YEL	GRN	Date Revised: 06/09/04 Initials: JAT
RESERVOIR REG. PLAN				NA
MAINTENANCE				NA

DOWNSTREAM CHANNEL	RED	YEL	GRN	Date Revised: 06/09/04 Initials: JAT
DOWNSTREAM CHANNEL				NA

CONCRETE STRUCTURES All concrete structures related to the dam, slopes, or spillway. OVERALL RATING >>>	RED Problems likely In < 2yrs ☐	YEL Problems likely In 2 - 5yrs ☐	GRN Problems likely In > 5yrs ☑	Date Revised: 6/9/2004 Initials: JAT
CONCRETE SURFACES Evaluate the deterioration and continuing serviceability of the concrete. Conditions should conform to "Guide for Making a Condition Survey of Concrete in Service," ACI Journal, proceedings Vol. 65, No.11, 11/68 pp. 905-918.		X		Comments: Local concrete spalling adjacent to a vertical joint on west wall (seen in 2003)
STRUCTURAL CRACKING Examine for cracking resulting from overstress due to applied loads, shrinkage and temperature effects or differential movements.			X	Comments: Minor hairline caracks in west spillway wall. One irregular crack across spillway slab; has been noted in several inspections with no apparent change.
HORIZONTAL & VERTICAL MOVEMENT Look for evidence of settlement, heaving, deflections, or lateral movements.			X	Comments:
JUNCTIONS Examine junctions of the structure with abutments or embankments. Note any abnormalities.			X	Comments:
DRAINS Ensure any drains are free flowing and capable of performing their function.			X	Comments: Spillway wall drains generally open.
WATER PASSAGES All surfaces in which water passes should be examined for erosion, cavitation, obstructions, leakage, and significant structural cracks.				Comments: NA
SEEPAGE Faces, abutments, and toes should be examined for evidence of abnormal leakage. Records of flow of downstream springs should be reviewed for variation with reservoir pool level.		X		Comments: Seepage seen in 2002 emerging from spillway slab at irregular crack downstream of last joint, apparently from under the slab. Slab under water 4-2-03 and 3-4-04.
JOINTS (Monolith and Construction) Determine condition of joint and filler material, any movement of joints, or any indication of distress.		X		Comments: Some joints in spillway slab repaired in 1997. Spalling, loose concrete surfaces noted at joints 1, 18 and 19 in 2002. Slab under water 3-4-04.
FOUNDATION Examine for damage of possible undermining of the downstream toe.			X	Comments:
ABUTMENTS Examine for signs of instability or excessive weathering.				Comments: NA

EMBANKMENT STRUCTURES	RED Problems likely in < 2yrs	YEL Problems likely in 2 - 5yrs	GRN Problems likely in > 5yrs	Date Revised: 6/9/2004 Initials: JAT
OVERALL RATING >>>	☐	☐	☑	
SETTLEMENT Embankment and downstream toe area need to be checked for localized settlement, depressions, or sink holes.		X		Comments: Several holes at top of rock toe need filling with stone.
SLOPE STABILITY Examine for irregularities in alignment and variances from smooth uniform slopes, unusual changes from original crest alignment and elevation, evidence of movement at or beyond toe, and surface cracks which indicate movement.			X	Comments:
SEEPAGE The downstream face of abutments, embankment slopes and toes, embankment - structure contacts, and the downstream valley areas should be examined for evidence of existing or past seepage. The sources of seepage should be investigated to determine cause and potential severity to dam safety under all operating conditions. The presence of animal burrows and tree growth on slopes which might cause detrimental seepage should be examined.			X	Comments: Slight flow along natural rock at junction between toe and cut slope east of discharge structure. Has been present for some time and causes no concern. Possible animal burrows at top of rock toe.
DRAINAGE SYSTEMS All drainage systems should be examined to determine whether the systems can freely pass discharge and that the discharge water is not carrying embankment or foundation material. Systems used to monitor drainage should be examined to assure they are operational and functioning properly.			X	Comments: Water appears to be flowing through rock toe without causing erosion or loss of fines.
SLOPE PROTECTION The slope protection should be examined for erosion-formed gullies and wave-formed notches ad benches that have reduced the embankment cross-section or expose less wave resistant materials. The adequacy of slope protection against waves, currents, and surface runitt that may occur at the site should be evaluated. The condition of vegetative cover should be evaluated where pertinent.			X	Comments: Continue spraying program for control of vegetation. Local shallow gullies in downstream slope appear stabilized by vegetation; monitor for change.

SPILLWAY STRUCTURES Examination should be made of the structures and features including bulkheads, flashboard, and fuse plugs of all service and auxillary spillways which serve as principal or emergency spillways for any condition which may impose operational constraints on the functioning of the spillway.	RED Problems likely in < 2yrs	YEL Problems likely in 2 - 5yrs	GRN Problems likely in > 5yrs	Date Revised: 6/9/2004 Initials: JAT
OVERALL RATING >>>	☐	☑	☐	
CONTROL GATES & OPERATIONAL MACHINERY Structural members, connections, hoists, cables and operating machinery and the adequacy of normal and emergency power supplies should be examined and tested to determine the structural integrity and verify the operational adequacy of the equipment. Where cranes are intended to be used for handling gates and bulkheads, the availability, capacity and condition of the cranes and lifting beams should be investigated. Operation of control systems and protective and alarm devices such as limit switches, sump high water alarms and drainage pump should be investigated.				Comments: NA
UNLINED SADDLE SPILLWAYS Examine for evidence of erosion and any conditions which may impose constraints on the function of the spillway. The ability of the spillway to resist erosion due to operation and the potential hazard to the safety of the dam.	X			Comments: Emergency spillway has tree growth on outlet end of east side that could obstruct flow. Trees need to be cut out to point where slope starts to drop off.
OUTLET CHANNELS Examine for any condition that may impose constraints on the functioning of the spillway and present a potential hazard to the safety of the dam.			X	Comments: Trees growing in outlet channel are maintained. Will need continued maintenance.
APPROACH CHANNELS Examine for any condition that may impose constraints on the functioning of the spillway and present a potential hazard to the safety of the dam.				Comments: NA
STILLING BASIN Basin and energy disipators should be examined for any conditions which may pose constraints on the ability of the stilling basin to prevent downstream scour or erosion which may create or present a potential hazard to the safety of the dam. The existing condition of the channel downstream of the stilling basin should be determined.			X	Comments:

OUTLET WORKS All structures and features designed to release reservoir water below the spillway crest through or around the dam. OVERALL RATING >>>	RED Problems likely in < 2yrs ☐	YEL Problems likely in 2 - 5yrs ☐	GRN Problems likely in > 5yrs ☑	Date Revised: 6/9/2004 Initials: JAT
INTAKE STRUCTURE Examine for any conditions which may impose operational constraints on the outlet works. Entrances to intake structure should be examined for conditions such as silt or debris accumulation which may reduce the discharge capabilities of the outlet works.			X	Comments: Located in lake, outside dam slope. Only above-water parts observed during dam inspections.
OPERATING AND EMERGENCY CONTROL GATES Structural members, connections, guides, hoists, cables and operating machinery including the adequacy of normal and emergency power supplies should be examined and tested to determine the structural integrity and verify the operational adequacy of the operating and emergency gates, valves, bulkheads, and other equipment.				Comments: NA
CONDUITS, SLUICES, WATER PASSAGES, ETC. Interior surfaces of conduits should be examined for erosion, corrosion, cavitation, cracks, joint separation and leakage at cracks or joints.				Comments: Not accessible
STILLING BASIN Basin and energy dissipaters should be examined for any conditions which may impose constraints on the ability of the stilling basin to prevent downstream scour or erosion which may create or present a potential hazard to the safety of the dam. The existing condition of the channel downstream of the stilling basin should be determined by surroundings.			X	Comments: Rip rap sides in good condition.
APPROACH CHANNELS Examine for any condition that may impose constraints on the functioning of the spillway and present a potential hazard to the safety of the dam.				Comments: NA
OUTLET CHANNELS Examine for any condition that may impose constraints on the functioning of the spillway and present a potential hazard to the safety of the dam.			X	Comments:
DRAWDOWN FACILITIES Facilities provided for drawdown of the reservoir to avert impending failure to the dam or to facilitate repairs in the event of stability or foundation problems should be examined for any conditions which may impose constraints on their functioning as planned.				Comments: Not accessible for inspection.

SAFETY & PERFORMANCE INSTRUMENTATION	RED	YEL	GRN	Date Revised: 6/9/2004 Initials: JAT
Available records and readings of installed instruments should be reviewed to detect any unusual performance of the instruments or evidence of unusual performance of the structure. The adequacy of the installed instrumentation to measure the performance and safety of the dam should be determined.	Problems likely in < 2yrs ☐	Problems likely in 2 - 5yrs ☐	Problems likely in > 5yrs ☑	
OVERALL RATING >>>				
HEADWATER AND TAILWATER GAGES				Comments:
Existing records of the headwater and tailwater gages should be examined to determine the relationship between other instrumentation measurements such as stream flow, uplift pressures, alignment, and drainage system discharge with the upper and lower water surface elevations.				NA
HORIZONTAL & VERTICAL ALIGNMENT INSTRUMENTATION (CONCRETE STRUCTURES)				Comments:
The existing records of alignment and elevation surveys amd measurements from inclinometers, inverted plumb bobs, gage points across cracks and joints, or other devices should be examined to determine any change from the original position of the structures.				NA
HORIZONTAL & VERTICAL MOVEMENT, CONSOLIDATION, AND PORE-WATER PRESSURE INSTRUMENTATION (EMBANKMENT STRUCTURES)			X	Comments:
The existing records of measurements from settlement plates or gages, surface reference marks, slope indicators and other devices should be examined to determine the movement history of the embankment. Existing piezometer measurements should be examined to determine if the pore-water pressures in the emankment and foundation would impair the safety of the dam, under given conditions.				Records not available at plant for review 3/4/04. No previous concerns. Movement monitors on crest are no longer usable, and do not need to be monitored.
UPLIFT INSTRUMENTATION				Comments:
Records of uplift measurements should be examined to determine if the uplift pressures for the maximum pool would impair the safety of the dam.				NA
DRAINAGE SYSTEM INSTRUMENTATION			X	Comments:
Records of measurements of the drainage system flow should be examined to establish the normal relationship between elevations and discharge quantities and any changes that have occurred in this relationship during the history of the dam.				Weir flow includes contributions from surface runoff.
SEISMIC INSTRUMENTATTION				Comments:
The existing records of seismic instrumentation should be examined to determine the seismic activity in the area and the response of the structures to past earthquakes.				NA

RESERVOIR The following features of the reservoir should be examined to determine to what extent the water impounded by the dam would constitute a danger to the safety of the dam or a hazard to human life or property.	RED Problems likely in < 2yrs	YEL Problems likely in 2 - 5yrs	GRN Problems likely in > 5yrs	Date Revised: 6/9/2004 Initials: JAT
OVERALL RATING >>>	☐	☐	☑	
SHORE LINE The land forms around the reservoir should be examined for indications of major active or inactive landslide areas and to determine susceptibility of bedrock stratigraphy to massive landslides of sufficient magnitude to significantly reduce reservoir capacity or create waves that might overtop the dam.				Comments: NA
SEDIMENTATION The reservoir and drainage area should be examined for excessive sedimentation or recent developments in the drainage basin which could cause a sudden increase in sediment load thereby reducing the reservoir capacity with attendant increase in maximum outflow and maximum pool elevation.			X	Comments:
POTENTIAL UPSTREAM HAZARD AREAS The reservoir area should be examined for features subject to potential backwater flooding resulting in loss of human life or property at reservoir levels up to the maximum water storage capacity including any surcharge storage.				Comments: NA
WATERSHED RUNOFF POTENTIAL The drainage basin should be examined for any extensive alterations to the surface of the drainage basin such as changed agriculture practices, timber clearing, railroad or highway construction or real estate developments that might expensively affect the runoff characteristics. Upstream projects that could have impact on the safety of the dam should be identified.				Comments: NA

OPERATION AND MAINTENANCE FEATURES	RED Problems likely In < 2yrs	YEL Problems likely In 2 - 5yrs	GRN Problems likely In > 5yrs	Date Revised: 6/9/2004 Initials: JAT
OVERALL RATING >>>	☐	☐	☐	
RESERVOIR REGULATION PLAN The actual practices in regulating the reservoir and discharges under normal and emergency conditions should be examined to determine if they comply with the designed reservoir regulation plan and to assure that they do not constitute a danger to the safety of the dam or to human life or property.				Comments: NA
MAINTENANCE The maintenance of the operating facilities and features that pertain to the safety of the dam should be examined to determine the adequacy and quality of the maintenance procedures followed in maintaining the dam and facilities in safe operating condition.				Comments: NA

DOWNSTREAM CHANNEL	RED	YEL	GRN	Date Revised: 6/9/2004	Initials: JAT
The channel immediately downstream of the dam should be examined for conditions which might impose any constraints on the operation of the dam or present any hazards to the safety of the dam. Development of the potential flooded area downstream of the dam should be assessed for the compatibility with the hazard classification.	Problems likely In < 2yrs	Problems likely In 2 - 5yrs	Problems likely In > 5yrs		
OVERALL RATING >>>	☐	☐	☐		
DOWNSTREAM CHANNEL				Comments: NA	

FOSSIL GENERATION COOLING AND ASH POND DAM ASSESSMENT FORM

Last Revised: 06/09/04

PLANT & UNIT: Mayo

ASH POND:

VENDOR: MACTEC Engineering and Consulting, Inc.

OTHER INFORMATION:

Comments: Based on field visit March 4, 2004

CONCRETE STRUCTURES	RED	YEL	GRN	Date Revised: 06/09/04 Initials: JAT
CONCRETE SURFACES				NA
STRUCTURAL CRACKING				NA
MOVEMENT				NA
JUNCTIONS				NA
DRAINS				NA
WATER PASSAGES				NA
SEEPAGE				NA
JOINTS				NA
FOUNDATION				NA
ABUTMENTS				NA

EMBANKEMENT STRUCTURES	RED	YEL	GRN	Date Revised: 06/09/04 Initials: JAT
SETTLEMENT			■	
SLOPE STABLITY			■	
SEEPAGE			■	
DRAINAGE SYSTEM			■	
SLOPE PROTECTION			■	

SPILLWAY STRUCTURES	RED	YEL	GRN	Date Revised: 06/09/04 Initials: JAT
CONTOL GATES				NA
UNLINED SPILLWAYS				NA
APPROACH CHANNEL				NA
OUTLET CHANNEL				NA
STILLING BASIN				NA

OUTLET WORKS	RED	YEL	GRN	Date Revised: 06/09/04 Initials: JAT
INTAKE STRUCTURE			■	
GATES				NA
SLUICES/WATER PASSAGES				NA
STILLING BASIN				NA
APPROACH CHANNEL				NA
OUTLET CHANNEL			■	
DRAWDOWN FACILITIES				NA

SAFETY/PERFORMANCE INSTRUMENTATION	RED	YEL	GRN	Date Revised: 06/09/04 Initials: JAT
HEADWATER/TAILWATER GAGES				NA
ALIGNMENT INSTRUMENTATION				NA
MOVEMENT INSTRUMENTATION			■	NA
UPLIFT INSTRUMENTATION				NA
DRAINAGE INSTRUMENTATION			■	
SEISMIC INSTRUMENTATION				NA

RESERVOIR	RED	YEL	GRN	Date Revised: 06/09/04 Initials: JAT
SHORE LINE				NA
SEDIMENTATION			■	
HAZARD AREAS				NA
WATERSHED RUNOFF				NA

OPS & MAINT FEATURES	RED	YEL	GRN	Date Revised: 06/09/04 Initials: JAT
RESERVOIR REG. PLAN				NA
MAINTENANCE				NA

DOWNSTREAM CHANNEL	RED	YEL	GRN	Date Revised: 06/09/04 Initials: JAT
DOWNSTREAM CHANNEL				NA

CONCRETE STRUCTURES All concrete structures related to the dam, slopes, or spillway. OVERALL RATING >>>	RED Problems likely in < 2yrs	YEL Problems likely in 2 - 5yrs	GRN Problems likely in > 5yrs	Date Revised: 6/9/2004 Initials: JAT
CONCRETE SURFACES Evaluate the deterioration and continuing serviceability of the concrete. Conditions should conform to "Guide for Making a Condition Survey of Concrete in Service," ACI Journal, proceedings Vol. 65, No.11, 11/68 pp. 905-918.				Comments: NA
STRUCTURAL CRACKING Examine for cracking resulting from overstress due to applied loads, shrinkage and temperature effects or differential movements.				Comments: NA
HORIZONTAL & VERTICAL MOVEMENT Look for evidence of settlement, heaving, deflections, or lateral movements.				Comments: NA
JUNCTIONS Examine junctions of the structure with abutments or embankments. Note any abnormalities.				Comments: NA
DRAINS Ensure any drains are free flowing and capable of performing their function.				Comments: NA
WATER PASSAGES All surfaces in which water passes should be examined for erosion, cavitation, obstructions, leakage, and significant structural cracks.				Comments: NA
SEEPAGE Faces, abutments, and toes should be examined for evidence of abnormal leakage. Records of flow of downstream springs should be reviewed for variation with reservoir pool level.				Comments: NA
JOINTS (Monolith and Construction) Determine condition of joint and filler material, any movement of joints, or any indication of distress.				Comments: NA
FOUNDATION Examine for damage of possible undermining of the downstream toe.				Comments: NA
ABUTMENTS Examine for signs of instability or excessive weathering.				Comments: NA

EMBANKMENT STRUCTURES	RED Problems likely In < 2yrs	YEL Problems likely In 2 - 5yrs	GRN Problems likely In > 5yrs	Date Revised: 6/9/2004 Initials: JAT
OVERALL RATING >>>	☐	☐	☑	
SETTLEMENT Embankment and downstream toe area need to be checked for localized settlement, depressions, or sink holes.			X	Comments:
SLOPE STABILITY Examine for irregularities in alignment and variances from smooth uniform slopes, unusual changes from original crest alignment and elevation, evidence of movement at or beyond toe, and surface cracks which indicate movement.			X	Comments:
SEEPAGE The downstream face of abutments, embankment slopes and toes, embankment - structure contacts, and the downstream valley areas should be examined for evidence of existing or past seepage. The sources of seepage should be investigated to determine cause and potential severity to dam safety under all operating conditions. The presence of animal burrows and tree growth on slopes which might cause detrimental seepage should be examined.			X	Comments: Slight flow of water along junction between natural ground and toe of slope south of Weir box 2. Believed to be groundwater or delayed release of rainwater. Unchanged since 2003 and earlier observations.
DRAINAGE SYSTEMS All drainage systems should be examined to determine whether the systems can freely pass discharge and that the discharge water is not carrying embankment or foundation material. Systems used to monitor drainage should be examined to assure they are operational and functioning properly.			X	Comments: Channels leading out from weir boxes need occasional cleaning of sediment. Outlet pipes at weirs have some iron deposits. Clean occasionally
SLOPE PROTECTION The slope protection should be examined for erosion-formed gullies and wave-formed notches ad benches that have reduced the embankment cross-section or expose less wave resistant materials. The adequacy of slope protection against waves, currents, and surface runitt that may occur at the site should be evaluated. The condition of vegetative cover should be evaluated where pertinent.			X	Comments: Local erosion spots in slope at junction with rip rap on downstream slope generally appear inactive; Monitor for change and fill with No. 78M stone if erosion is reactiviated

SPILLWAY STRUCTURES	RED	YEL	GRN	Date Revised: 6/9/2004 Initials: JAT
Examination should be made of the structures and features including bulkheads, flashboard, and fuse plugs of all service and auxiliary spillways which serve as principal or emergency spillways for any condition which may impose operational constraints on the functioning of the spillway.	Problems likely in < 2yrs	Problems likely in 2 - 5yrs	Problems likely in > 5yrs	
OVERALL RATING >>>	☐	☐	☐	
CONTROL GATES & OPERATIONAL MACHINERY Structural members, connections, hoists, cables and operating machinery and the adequacy of normal and emergency power supplies should be examined and tested to determine the structural integrity and verify the operational adequacy of the equipment. Where cranes are intended to be used for handling gates and bulkheads, the availability, capacity and condition of the cranes and lifting beams should be investigated. Operation of control systems and protective and alarm devices such as limit switches, sump high water alarms and drainage pump should be investigated.				Comments: NA
UNLINED SADDLE SPILLWAYS Examine for evidence of erosion and any conditions which may impose constraints on the function of the spillway. The ability of the spillway to resist erosion due to operation and the potential hazard to the safety of the dam.				Comments: NA
OUTLET CHANNELS Examine for any condition that may impose constraints on the functioning of the spillway and present a potential hazard to the safety of the dam.				Comments: NA
APPROACH CHANNELS Examine for any condition that may impose constraints on the functioning of the spillway and present a potential hazard to the safety of the dam.				Comments: NA
STILLING BASIN Basin and energy dissipators should be examined for any conditions which may pose constraints on the ability of the stilling basin to prevent downstream scour or erosion which may create or present a potential hazard to the safety of the dam. The existing condition of the channel downstream of the stilling basin should be determined.				Comments: NA

OUTLET WORKS All structures and features designed to release reservoir water below the spillway crest through or around the dam. OVERALL RATING >>>	RED Problems likely in < 2yrs ☐	YEL Problems likely in 2 - 5yrs ☐	GRN Problems likely in > 5yrs ☑	Date Revised: 6/9/2004 Initials: JAT
INTAKE STRUCTURE Examine for any conditions which may impose operational constraints on the outlet works. Entrances to intake structure should be examined for conditions such as silt or debris accumulation which may reduce the discharge capabilities of the outlet works.			X	Comments: Only skimmer visible.
OPERATING AND EMERGENCY CONTROL GATES Structural members, connections, guides, hoists, cables and operating machinery including the adequacy of normal and emergency power supplies should be examined and tested to determine the structural integrity and verify the operational adequacy of the operating and emergency gates, valves, bulkheads, and other equipment.				Comments: NA
CONDUITS, SLUICES, WATER PASSAGES, ETC. Interior surfaces of conduits should be examined for erosion, corrosion, cavitation, cracks, joint separation and leakage at cracks or joints.				Comments: Inaccessible
STILLING BASIN Basin and energy dissipaters should be examined for any conditions which may impose constraints on the ability of the stilling basin to prevent downstream scour or erosion which may create or present a potential hazard to the safety of the dam. The existing condition of the channel downstream of the stilling basin should be determined by surroundings.				Comments: NA
APPROACH CHANNELS Examine for any condition that may impose constraints on the functioning of the spillway and present a potential hazard to the safety of the dam..				Comments: NA
OUTLET CHANNELS Examine for any condition that may impose constraints on the functioning of the spillway and present a potential hazard to the safety of the dam.			X	Comments: Channel is cut into natural ground.
DRAWDOWN FACILITIES Facilities provided for drawdown of the reservoir to avert impending failure to the dam or to facilitate repairs in the event of stability or foundation problems should be examined for any conditions which may impose constraints on their functioning as planned.				Comments: NA

SAFETY & PERFORMANCE INSTRUMENTATION	RED	YEL	GRN	Date Revised: 6/9/2004 Initials: JAT
Available records and readings of installed instruments should be reviewed to detect any unusual performance of the instruments or evidence of unusual performance of the structure. The adequacy of the installed instrumentation to measure the performance and safety of the dam should be determined. OVERALL RATING >>>	Problems likely In < 2yrs ☐	Problems likely In 2 - 5yrs ☐	Problems likely In > 5yrs ☑	
HEADWATER AND TAILWATER GAGES Existing records of the headwater and tailwater gages should be examined to determine the relationship between other instrumentation measurements such as stream flow, uplift pressures, alignment, and drainage system discharge with the upper and lower water surface elevations.				Comments: NA
HORIZONTAL & VERTICAL ALIGNMENT INSTRUMENTATION (CONCRETE STRUCTURES) The existing records of alignment and elevation surveys amd measurements from inclinometers, inverted plumb bobs, gage points across cracks and joints, or other devices should be examined to determine any change from the original position of the structures.				Comments: NA
HORIZONTAL & VERTICAL MOVEMENT, CONSOLIDATION, AND PORE-WATER PRESSURE INSTRUMENTATION (EMBANKMENT STRUCTURES) The existing records of measurements from settlement plates or gages, surface reference marks, slope indicators and other devices should be examined to determine the movement history of the embankment. Existing piezometer measurements should be examined to determine if the pore-water pressures in the emankment and foundation would impair the safety of the dam, under given conditions.			X	Comments: Readings being furnished to Raleigh and not available at site for review. Readings will be reviewed for final report
UPLIFT INSTRUMENTATION Records of uplift measurements should be examined to determine if the uplift pressures for the maximum pool would impair the safety of the dam.				Comments: NA
DRAINAGE SYSTEM INSTRUMENTATION Records of measurements of the drainage system flow should be examined to establish the normal relationship between elevations and discharge quantities and any changes that have occurred in this relationship during the history of the dam.			X	Comments: Weir plates have been damaged and flows are measured with a graduated cylinder and stop watch. Outlet flow channel needs to be kept open.
SEISMIC INSTRUMENTATTION The existing records of seismic instrumentation should be examined to determine the seismic activity in the area and the response of the structures to past earthquakes.				Comments: NA

RESERVOIR	RED Problems likely in < 2yrs	YEL Problems likely in 2 - 5yrs	GRN Problems likely in > 5yrs	Date Revised: 6/9/2004 Initials: JAT
The following features of the reservoir should be examined to determine to what extent the water impounded by the dam would constitute a danger to the safety of the dam or a hazard to human life or property.				
OVERALL RATING >>>	☐	☑	☐	
SHORE LINE The land forms around the reservoir should be examined for indications of major active or inactive landslide areas and to determine susceptibility of bedrock stratigraphy to massive landslides of sufficient magnitude to significantly reduce reservoir capacity or create waves that might overtop the dam.				Comments: NA
SEDIMENTATION The reservoir and drainage area should be examined for excessive sedimentation or recent developments in the drainage basin which could cause a sudden increase in sediment load thereby reducing the reservoir capacity with attendant increase in maximum outflow and maximum pool elevation.			X	Comments: Activity planned to reroute fly ash discharge line to improve pond filling sequence.
POTENTIAL UPSTREAM HAZARD AREAS The reservoir area should be examined for features subject to potential backwater flooding resulting in loss of human life or property at reservoir levels up to the maximum water storage capacity including any surcharge storage.				Comments: NA
WATERSHED RUNOFF POTENTIAL The drainage basin should be examined for any extensive alterations to the surface of the drainage basin such as changed agriculture practices, timber clearing, railroad or highway construction or real estate developments that might expensively affect the runoff characteristics. Upstream projects that could have impact on the safety of the dam should be identified.				Comments: NA

OPERATION AND MAINTENANCE FEATURES	RED Problems likely in < 2yrs	YEL Problems likely in 2 - 5yrs	GRN Problems likely in > 5yrs	Date Revised: 6/9/2004 Initials: JAT
OVERALL RATING >>>	☐	☐	☐	
RESERVOIR REGULATION PLAN The actual practices in regulating the reservoir and discharges under normal and emergency conditions should be examined to determine if they comply with the designed reservoir regulation plan and to assure that they do not constitute a danger to the safety of the dam or to human life or property.				Comments: NA
MAINTENANCE The maintenance of the operating facilities and features that pertain to the safety of the dam should be examined to determine the adequacy and quality of the maintenance procedures followed in maintaining the dam and facilities in safe operating condition.				Comments: NA

DOWNSTREAM CHANNEL The channel immediately downstream of the dam should be examined for conditions which might impose any constraints on the operation of the dam or present any hazards to the safety of the dam. Development of the potential flooded area downstream of the dam should be assessed for the compatibility with the hazard classification. OVERALL RATING >>>	RED Problems likely in < 2yrs ☐	YEL Problems likely in 2 - 5yrs ☐	GRN Problems likely in > 5yrs ☐	Date Revised: 6/9/2004 Initials: JAT
DOWNSTREAM CHANNEL				Comments: NA

Progress Energy: Mayo, NC

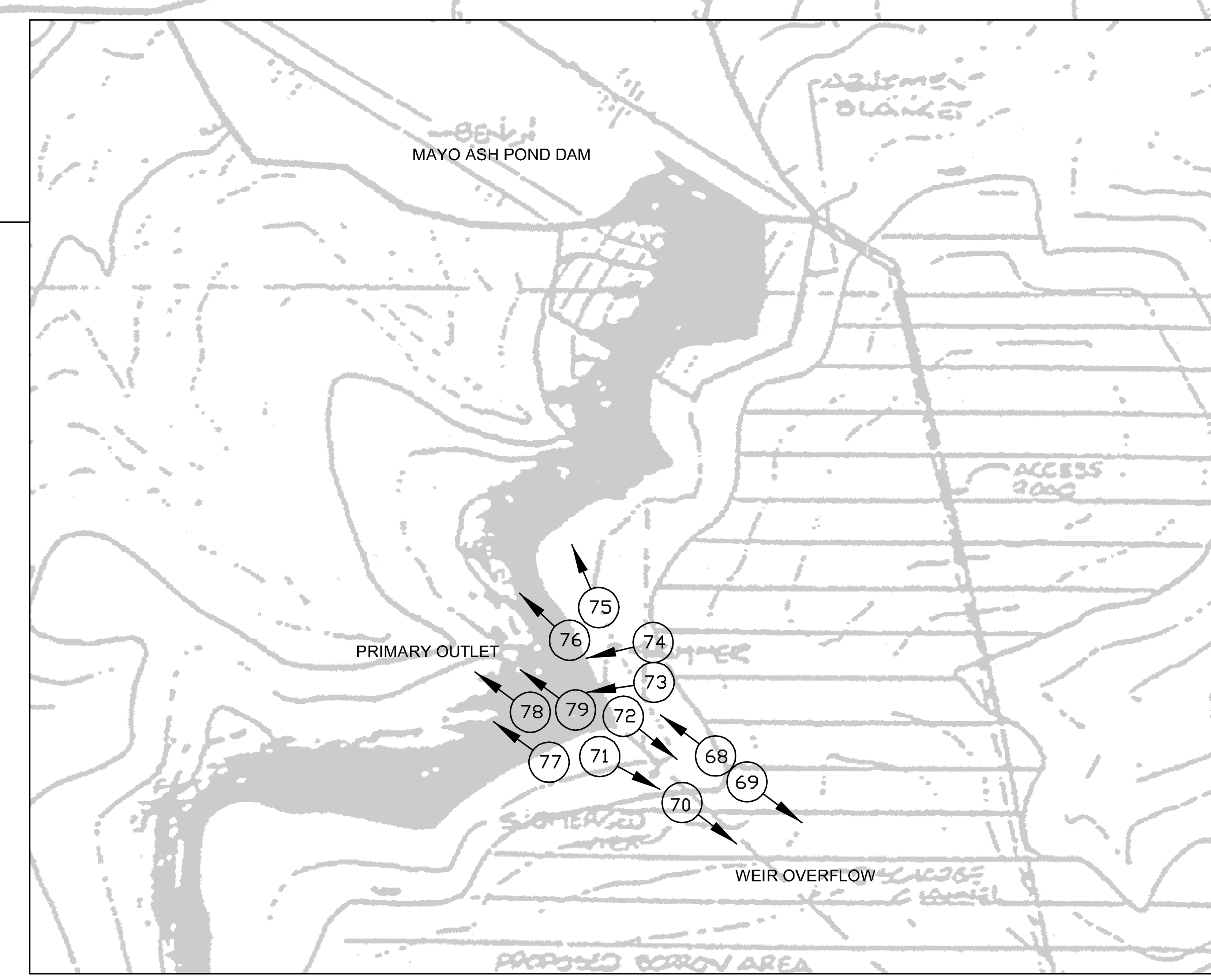
The ash pond and associated dam impoundment is located within Person County, NC. Person County is within the Piedmont Physiographic Province in North Carolina. The Piedmont Physiographic Province generally consists of rolling, well-rounded hills and ridges.

The ash pond and dam impoundment is further classified by its location in the Milton Geologic Belt, near the border with the Carolina Slate Belt. The rock within the Milton Belt is composed of gneiss, schist, and metamorphosed intrusive rocks. The belt is best known for crushed stone (utilized for aggregate and building construction).

The rock within the pond and dam impoundment area is classified as CZfv, per the Geologic Map of North Carolina. The CZfv classification represents a Felsic Metavolcanic rock (metamorphosed dacitic to rhyolitic flows and tuffs, light gray to greenish gray; minor mafic and intermediate metavolcanic rock). Directly west of the dam embankment and pond edge, the rock is classified as CZfg, which represents a Felsic Mica Gneiss (interlayered with biotite and hornblende gneiss and schist).

Two faults are located in the vicinity of the ash pond and dam impoundment. The Dan River Fault Zone is located approximately forty (40) miles West of the ash pond and dam impoundment and the Nutbush Creek Fault is located approximately fifty (50) miles East of the ash pond and dam impoundment. Additionally, a geological dike is located approximately ten (10) to fifteen (15) miles Southeast of the ash pond and dam impoundment.

Mayo Ash Pond Dam

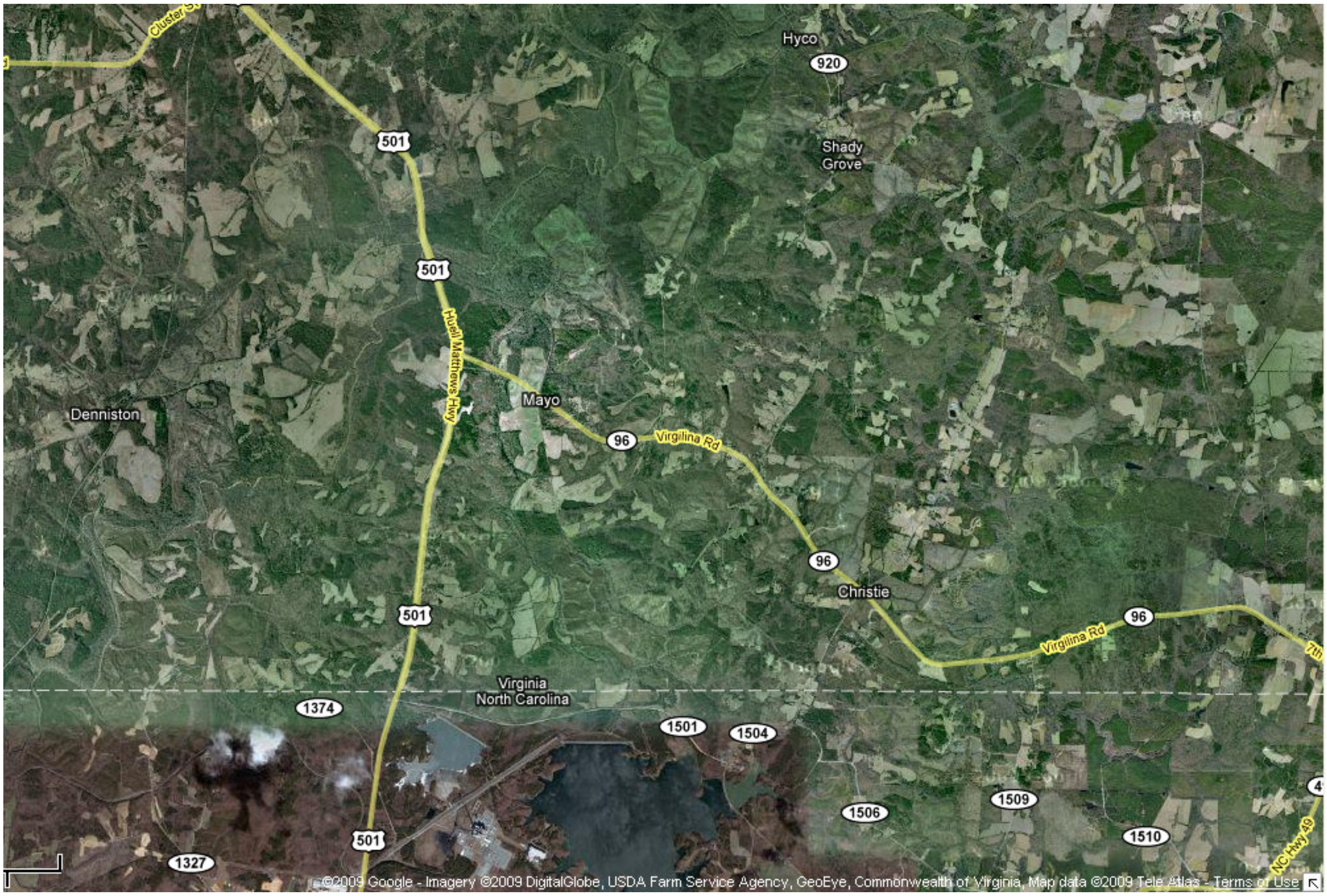


Outfall (south of dam)

Mayo Ash Pond - Photo Log
June 3. 2009

Appendix A – Doc 10

Mayo Ash Pond Dam



APPENDIX B - PHOTOGRAPHS

Photo 1: Upstream Embankment, Crest, Photo: 042, 6/3/09

Photo 2: Crest Looking Northwest, Crest, Photo: 041, 6/3/09

Photo 3: Bare Areas and Straw Build Up, Downstream Embankment, Photo: 004, 6/3/09

Photo 4: Mowing Equipment Rutting, Downstream Embankment, Photo: 007, 6/3/09

Photo 5: Embankment Looking to Right Abutment, Downstream Embankment, Photo: 036, 6/3/09
(Note right and left are referenced from observer facing downstream)

Photo 6: View of Left Groin and Embankment, Left Groin, Photo: 032, 6/3/09
(Note right and left are referenced from observer facing downstream)

Photo 7: Internal Drain Outlet, Toe, Photo: 019, 6/3/09

Photo 8: View of Ash Pond and Upstream Slope, Near Primary Outlet, Photo: 075, 6/3/09

Photo 9: riser and skimmer at stilling pool, Photo: 079, 6/3/09

Photo 10: stilling pool staff gauge near spillway, Photo: 072, 6/3/09

Photo 11 concrete overflow weir spillway, Photo: 068, 6/3/09

Photo 12: Downstream channel looking upstream at stilling pool with embankment dam in background, Photo: 069, 6/3/09

Coal Combustion Dam Inspection Checklist Form

US Environmental Protection Agency

Site Name: Progress Energy - Mayo
Date: 3 JUNE 2009
Unit Name: 1982 POND
Operator's Name: Progress Energy
Unit I.D.:
Hazard Potential Classification: High **Significant** Low
Inspector's Name: Frederic Shmurak / JUSTIN STORY

Check the appropriate box below. Provide comments when appropriate. If not applicable or not available, record "N/A". Any unusual conditions or construction practices that should be noted in the comments section. For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	QUARTERLY		18. Sloughing or bulging on slopes?		✓
2. Pool elevation (operator records)?	480		19. Major erosion or slope deterioration?		✓
3. Decant inlet elevation (operator records)?	N/A		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	480		Is water entering inlet, but not exiting outlet?		N/A
5. Lowest dam crest elevation (operator records)?	490		Is water exiting outlet, but not entering inlet?		N/A
6. If instrumentation is present, are readings recorded (operator records)?	✓		Is water exiting outlet flowing clear?		N/A
7. Is the embankment currently under construction?		✓	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation,stumps, topsoil in area where embankment fill will be placed)?		N/A	From underdrain?	✓	NO FINES
9. Trees growing on embankment? (If so, indicate largest diameter below)		✓	At isolated points on embankment slopes?		✓
10. Cracks or scarps on crest?		✓	At natural hillside in the embankment area?		✓
11. Is there significant settlement along the crest?		✓	Over widespread areas?		✓
12. Are decant trashracks clear and in place?		N/A	From downstream foundation area?		✓
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		✓	"Boils" beneath stream or ponded water?		✓
14. Clogged spillways, groin or diversion ditches?		✓	Around the outside of the decant pipe?		N/A
15. Are spillway or ditch linings deteriorated?		✓	22. Surface movements in valley bottom or on hillside?		✓
16. Are outlets of decant or underdrains blocked?		✓	23. Water against downstream toe?		✓
17. Cracks or scarps on slopes?		✓	24. Were Photos taken during the dam inspection?	✓	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Inspection Issue # Comments

1. Isolated Bare Areas Along D/S slope require Grassing.
2. Small Animal Guards Need to be installed AT underdrain outlets.

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # ____________ INSPECTOR Frederic Shmurak / JUSTIN STORY

Date ____________

Impoundment Name Progress Energy - Mayo Ash Pond

Impoundment Company Progress Energy

EPA Region IV

State Agency (Field Office) Addresss N/A

Name of Impoundment 1982 Ash Pond

(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New ________ Update ________

	Yes	No
Is impoundment currently under construction?		✓
Is water or ccw currently being pumped into the impoundment?	✓	

IMPOUNDMENT FUNCTION: settle & store coal ash

Nearest Downstream Town : Name South Boston, VA

Distance from the impoundment ~11 miles

Impoundment Location:

Longitude	78	Degrees	53	Minutes	35	Seconds
Latitude	36	Degrees	32	Minutes	16	Seconds
State	NC	County	Person			

Does a state agency regulate this impoundment? YES ______ NO ✓

If So Which State Agency? N/A

HAZARD POTENTIAL (In the event the impoundment should fail, the following would occur):

______ **LESS THAN LOW HAZARD POTENTIAL:** Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

______ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

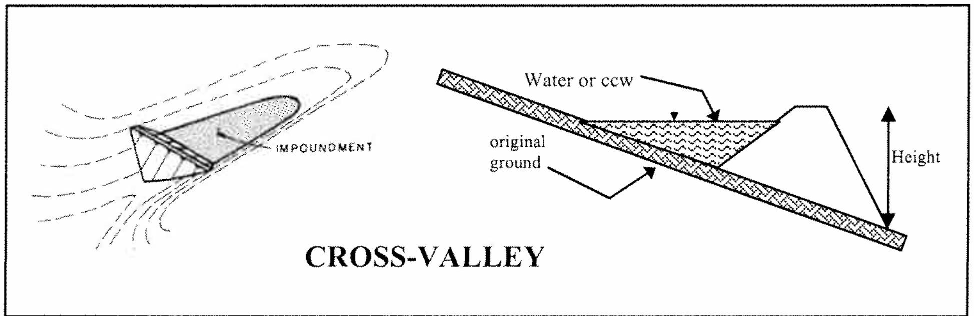
__✓__ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

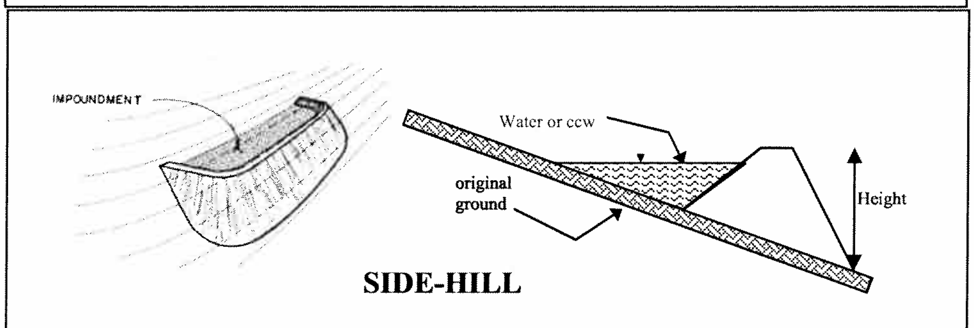
______ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

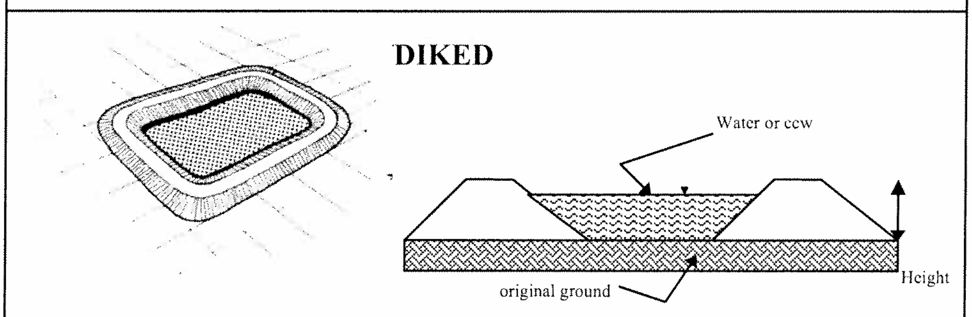
DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

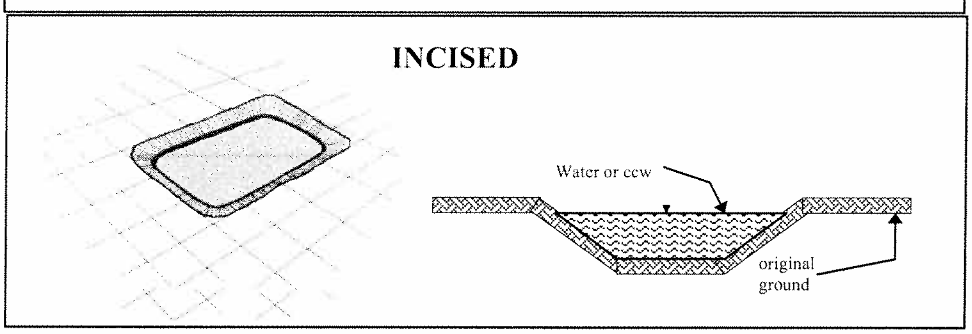
Located in predominantly rural / agricultural area with few unimproved road crossings.

CONFIGURATION:









_✓_ Cross-Valley
_____ Side-Hill
_____ Diked
_____ Incised (form completion optional)
_____ Combination Incised/Diked

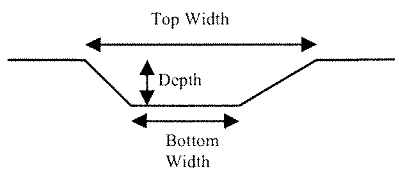
Embankment Height _90_ feet   Embankment Material _EARTH_
Pool Area _140_ acres   Liner _CLAY ALONG U/S SIDE ONLY_
Current Freeboard _10_ feet   Liner Permeability _UNKNOWN_

TYPE OF OUTLET (Mark all that apply)

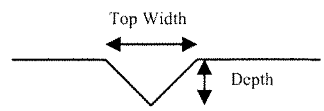
_____ **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Rectangular
_____ Irregular

_____ depth
_____ bottom (or average) width
_____ top width

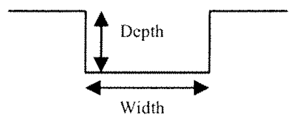
TRAPEZOIDAL



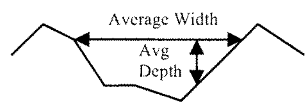
TRIANGULAR



RECTANGULAR

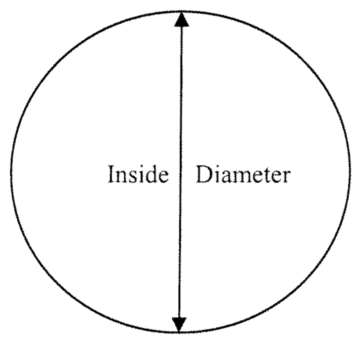


IRREGULAR



_____ **Outlet**

_____ inside diameter



Material
_____ corrugated metal
_____ welded steel
_____ concrete
_____ plastic (hdpe, pvc, etc.)
_____ other (specify) ____________________

Is water flowing through the outlet? YES ✓ NO _______

_____ **No Outlet**

✓ **Other Type of Outlet** (specify) BROAD crested weir

The Impoundment was Designed By Carolina Power & Light Company

Has there ever been a failure at this site? YES __________ NO ____✓____

If So When? ____________________________

If So Please Describe : ____________________________

Has there ever been significant seepages at this site? YES _______ NO ✓

If So When? ____________________________

IF So Please Describe: ____

Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site? YES ________ NO ✓

If so, which method (e.g., piezometers, gw pumping,...)? ____________________

If so Please Describe : ____________________